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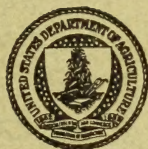
**THE HORSEFLIES OF THE  
SUBFAMILY TABANINAE OF THE  
NEARCTIC REGION**

By

**ALAN STONE, Associate Entomologist**

Division of Insect Identification

Bureau of Entomology and Plant Quarantine









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By ALAN STONE,<sup>1</sup> *associate entomologist, Division of Insect Identification,  
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## INTRODUCTION

In 1875-78 Osten Sacken's Prodrôme of a Monograph of the Tabanidae of the United States appeared. In this work (15)<sup>2</sup> 38

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## CORRECTION SLIP

- Page 15, couplet 2, line 7, for Widemann read Wiedemann.  
Page 41, couplet 57, line 1, for *styqins* read *stygius*.  
Page 48, couplet 15, line 2, for *fumipenins* read *fumipennis*.  
Page 51, couplet 65, line 1, for tribial read tibial.  
Page 74, paragraph 2, line 1, for dialonal read diagonal.

the western part of the United States and Canada. Since Osten Sacken's time many species have been described by Bigot, Marten, Whitney, Hine, McDunnough, Philip, and others, and a number of the species of older authors have been recognized and others synonymized. The need for gathering this information together, for more accurate descriptions of the known species, for recognition of new ones, and for serviceable keys that more correctly define the genera and species of this economically important group of insects has become imperative; the purpose of this publication is to satisfy these demands.

In this publication 11 genera and 154 species of Nearctic<sup>3</sup> Tabaninae are recognized. Fourteen species and 1 variety are described as new, 1 genus has been transferred to the subfamily Pangoniinae, 1 subgenus has been raised to generic rank, 20 species and 1 variety have been sunk as synonyms, and 3 species have been reduced to subspecific or varietal status.

No claim can be made for this publication as a definitive work on the subject. Judging from the number of new species that have been found within the past few years by Philip and the writer it is quite probable that others remain to be discovered. Further study of types now in European museums will probably necessitate changes of names in certain cases. It is possible that further division will be necessary in certain species, notably *Atylotus insuetus*, *Tabanus lineola*, *T. sulcifrons*, and *T. septentrionalis*. These species occur in considerable abundance at times and show variations which may be of subspecific or even specific value. With the material at hand, however, the writer has been unable to delimit the variants satisfactorily. Finally, the genus *Tabanus*, as restricted in this publication, still contains species of considerable divergence and it may be that satisfactory characters, usable in keys, can still be found to subdivide the genus further. Many characters have been suggested in the past and there is no lack of available names, but none of the characters proposed appears to hold satisfactorily.

### ECONOMIC IMPORTANCE

As irritating pests of domestic animals and proved or suspected transmitters of disease, the Tabanidae probably rank next to the mosquitoes in importance. Within the subfamily Tabaninae the serious pests are almost all confined to the genus *Tabanus*. *Haematopota americana* will attack man and animals readily but rarely occurs in numbers sufficient to cause serious annoyance, and although *Diachlorus ferrugatus*, the yellow fly of the Dismal Swamp, is troublesome in the coastal swamps of the southeastern part of the United States, its range is limited and sparsely inhabited. A number of species of *Tabanus*, however, occur in large enough numbers to make them serious pests. Notable among these are *T. nigrovittatus* of the Atlantic and Gulf coasts, *sulfifrons* of the East Central States, and *punctifer*, *septentrionalis*, *sonomensis*, and *rhombicus* of the West.

The damage done by the horseflies is due both to the annoyance and loss of blood caused by the feeding of the females, and also to their

<sup>3</sup> As considered in this publication, the Nearctic region comprises all of North America north of Mexico.



transmission of disease. The irritation they produce in domestic animals results in loss of weight and milk production, runaways, and wounds due to kicking or hooking by animals trying to fight them off. These wounds often provide an entrance for bacterial or fly maggot infection. The loss of blood during an outbreak of horseflies has been computed by Webb and Wells (23) and may be very considerable. While man is not so seriously affected by tabanine species, their presence in large numbers at bathing beaches is often very annoying.

The mechanical spread of anthrax by horseflies in the South is a well recognized example of disease transmission, and there is a strong possibility that horseflies play a considerable part in distributing the causative organisms of equine infectious anemia or swamp fever, equine encephalomyelitis or brain fever, and anaplasmosis of cattle. Their intermittent method of feeding greatly enhances the possibility of the mechanical transmission of diseases. In the Old World surra and other trypanosome diseases and blackleg are known to be transmitted by horseflies. In the United States tularaemia transmission by *Chrysops* has been demonstrated, and it is not impossible that some of the tabanine species may be vectors of the disease.<sup>4</sup>

### RELATIONSHIPS

The family Tabanidae is characterized by having the apex of the wing included in cell R<sub>4</sub>, three-segmented antenna, the third segment composed of annuli, the empodia pulvilliform, at least the middle tibia with spurs, and the squamae large and conspicuous.

In this paper the subfamily Tabaninae is treated in a broad sense to include all the species lacking spurs on the hind tibia. In addition to the absence of spurs, ocelli are usually completely lacking and never more than rudimentary. As thus defined, the subfamily Tabaninae corresponds to the section Opistanoplae of Lutz, in contradistinction to the Opistacanthae, or Pangoniinae in the broad sense. Lutz (12) recognized three subfamilies in the Opistanoplae, the Tabaninae, Diachlorinae, and Lepiselaginae. Enderlein (3) increased the number of subfamilies in the family from the 5 of Lutz to 10, the Opistanoplae containing the Haematapotinae, Chasmiinae, Diachlorinae, Tabaninae, and Bellardiinae. The genus *Lepiselaga* and related genera he placed in the tribe Lepiselagini, subfamily Tabaninae, rather than retaining the subfamily Lepiselaginae of Lutz. Kröber (11), in his catalog of neotropical Tabanidae, retained the subfamily Lepiselaginae and added the Stenotabaninae.

In the Nearctic fauna we have representatives of three of the subfamilies that might be recognized. These are the genus *Haematopota*, the genus *Diachlorus*, and the genus *Tabanus* with its related genera. The writer does not feel that the genus *Stenotabanus* can be placed in a different subfamily from the genus *Tabanus*, and if it were, certainly the genera *Bolbodimyia* and *Whitneyomyia* would require another subfamily rather than being placed with the genus *Stenotabanus*. The character of the closed cell R<sub>5</sub>, used to separate

<sup>4</sup>For a further discussion of the economic importance of Tabanidae in North America, papers by Cameron (2), Knowlton and Rowe (7), Morris (14), Philip (16), Sanborn, Stiles, and Moe (18), Schwardt (19), Scott (20), and Webb and Wells (23) should be consulted.



the Bellardiinae, is frequently not even of generic value, and the shape of the basal portion of the third antennal segment, when used alone, is rarely of even generic value. For the purposes of a taxonomic study of the entire family some of the more restricted subfamilies are undoubtedly desirable, but for this revision the writer prefers to interpret the subfamily more broadly as Brennan has done in the case of the Pangoniinae. It is the writer's opinion that because superficial characters have been utilized for separating the larger groups of Tabanidae, much of the present classification obscures rather than elucidates the true relationships. The Tabanidae show unusually little variation of a fundamental character, and a great deal more must be learned of the morphology and biology, particularly of the immature stages, before a satisfactory natural classification can be attained.

### CHARACTERS OF VALUE AND THEIR TERMINOLOGY

There is a decided paucity of structural characters in the Tabanidae, and the few present are nearly all confined to the head. Macrochaetae being absent, chaetotaxy cannot be utilized. The wing venation is relatively constant throughout the subfamily Tabaninae, and what modifications there are tend to be inconstant within a species. Because structural characters are few and because many of the cephalic characters are confined to the female, it is necessary to depend on coloration to a considerable extent.

#### TINCTORIAL CHARACTERS

The eye pattern is usually found only in fresh or relaxed specimens, the frequently brilliant color fading shortly after death and eventually disappearing. This must be remembered when the descriptions are being read. *Pollinosity*, as used in this publication, means any fine dusting over a surface regardless of its color. Unless otherwise stated, body coloration is the color of the pollinose surface. The presence or absence of pollen is frequently of taxonomic importance. The abdominal pattern is of greatest value and serves to separate the genus *Tabanus* into rather well defined groups.

#### CEPHALIC CHARACTERS

The term *frons* is here applied to that portion of the head between the eyes and from near the top of the head to the lower, inner angle of the eyes. Morphologically the frons is marked above by the position of the median ocellus, when present, and below by a suture just below the antennae, but for the part below the level of the lower, inner angle of the eye the writer retains the descriptive term *subcallus*. In the male the frons is reduced to a very narrow triangle below the eyes, which, combined with the subcallus, the writer calls the *frontal triangle*. The term *vertex* is used here for the top of the head between the eyes. Frequently a tubercle is present on the vertex at a point corresponding to the position of the ocelli in many Pangoniinae. This has been called the *ocellar tubercle* or *ocelligerous*

*tubercle*. The writer retains the former term, since the tubercle does not bear ocelli in the Tabaninae. On the frons are usually two denuded calli, one at the lower margin, formerly called the *frontal callus*, but which the writer terms the *basal callus*, and the *median callus*, usually narrower and often broadly joined to the basal callus. The *clypeus* lies below the antennae and above the oral margin, with the *genae* to each side. The *antenna* consists of three segments, the third composed of a large *basal portion* and an attenuated *annulate portion*. The number of divisions in the third antennal segment is frequently of generic significance, the basal portion being the first division. The basal portion is compressed and usually has a dorsal angle near its base; by the width of the basal portion is meant its greatest vertical dimension.

#### THORACIC CHARACTERS

The term *prescutal lobe* is used in place of antealar callus. The Comstock-Needham terminology of the wing veins and cells is used because it is easily applied in the Tabanidae and because this terminology is being used increasingly both in this country and abroad. While it will probably be necessary to change the original designation of the veins in the tabanid wing more accurately to reflect the morphology, the proper terminology is still so doubtful that, for descriptive purposes, the writer retains the old terminology. By *furcation* is meant the point of separation of veins  $R_4$  and  $R_5$ , and by *normal venation* is meant that of the typical *Tabanus* wing with no stump vein from base of vein  $R_4$  and with cell  $R_5$  open. For descriptive purposes the writer uses the term *cross veins* to include all of the shorter, relatively transverse veins, some of which are only basal portions of longitudinal veins, but which are all subject to marginal infuscation.

#### SEXUAL DIMORPHISM

This is found principally in the head structures. The eyes of the male are holoptic and they frequently consist of two types of ommatidia, the upper ones large and the lower ones small, with the color pattern confined to the lower ones. The antenna is decidedly more slender in the male. The maxillary palpus of the male is reduced, the second segment being short and extending forward, rather than longer and curved downward. The hair of the head and thorax is usually darker in the male. The abdomen of the male is narrower apically than that of the female. The writer has tried to find characters in both the male and female terminalia but has succeeded in finding none of any value. In this publication he describes the males very briefly, both because they are much less frequently encountered and because, save for the secondary sexual differences, they usually very closely resemble the female.

#### ILLUSTRATIONS

The illustrations used are semidiagrammatic in that no attempt is made to indicate the color patterns of the head or antenna, the calli of the frons are made black regardless of the actual color, and, except on the antenna, the hair is not shown. Accuracy of propor-



tion was obtained by using a micrometer disk ruled in squares and coordinate paper ruled with pale blue lines. All of the figures represent an enlargement of about 7.7 diameters.

### The Genus *MERYCOMYIA* Hine

*Merycomyia* Hine, Ohio Nat. 12: 515-516, 1912. (Genotype, *Merycomyia geminata* Hine=*M. whitneyi* (Johnson).)

This genus is treated separately because a study of all available material convinces the writer that the genus is pangoniine rather than tabanine, although Johnson (5) placed the type of the genus in *Tabanus* and Hine, in describing the genus, states, “\* \* \* no spurs at apex of hind tibia, \* \* \*.” The types of *Merycomyia geminata* are apparently lost, but Hine admitted the identity of *geminata* and *whitneyi* and there is no question but that they are the same. The type male of *whitneyi* shows extremely small hind tibial spurs; the allotype has one distinct spur, the others being broken off. Two other specimens show the spurs small but distinct. Edward S. Thomas examined the type of *M. mixta* Hine for the writer and found spurs present in this species also.

In addition to the presence of spurs, the presence of well developed ocelli and the shape of the female frons and palpus are typically pangoniine. Since only three or four divisions are to be found in the antennal flagellum, the genus falls in neither half of the first couplet of Brennan's (1) key to the genera of Pangoniinae. This and other characters seem clearly to separate it from all described genera of Tabanidae.

### KEY TO THE GENERA OF NEARCTIC TABANINAE

1. First antennal segment considerably longer than thick; frons of female widened below, broader than high, with a velvety-black spot to each side at angle made by eye and subcallus; third antennal segment with four divisions; wing gray, with small white maculations.....*Haematopota* Meigen, p. 7.
- First antennal segment usually scarcely longer than thick; frons of female not broader than high, without velvety-black spots; third antennal segment usually with five divisions; wing pattern, if any, otherwise..... 2
2. Eye bare; subcallus very swollen and shiny; genae denuded; dorsal angle of third antennal segment small and blunt; wing at least partially blackened..... 3
- Without above combination of characters; if the subcallus is enlarged and denuded, the eye is densely pilose..... 4
3. First antennal segment swollen, at least below; apical half of vein R<sub>4</sub> turned abruptly forward; wing, at least anteriorly, blackened, with a crescent-shaped, hyaline apex; tibiae somewhat swollen.....*Bolbodimyia* Bigot, p. 10.
- First antennal segment not noticeably swollen; vein R<sub>4</sub> not turned abruptly forward; apex of wing not hyaline; tibiae not swollen.....*Whitneyomyia* Bequaert, p. 11.
4. Third antennal segment with no dorsal angle; frons of female very narrow, the median callus a very slender line; no ocellar tubercle; wing with at least a subapical brown spot; eye bare.....*Diachlorus* Osten Sacken, p. 12.
- Not with this combination of characters..... 5
5. Basal portion of third antennal segment with a prominent, forward-projecting tooth reaching nearly to base of annulate portion; eye pilose.....*Di cladocera* Lutz, p. 14.



- Basal portion of third antennal segment with or without a prominent dorsal angle, but if this is produced forward the eye is bare----- 6
6. Basal callus in female lacking or very much reduced, separated from eye by a considerable space; neither palpus black nor abdomen with a narrow dorsal stripe----- 7
- Basal callus in female as wide, or nearly as wide, as frons, or, if narrowed, still considerably wider than median callus; either palpus black or abdomen with a narrow dorsal stripe----- 9
7. Eye distinctly pilose; no distinct ocellar tubercle (eye of female usually with a single, diagonal, purple line which often shows even in dried specimens).-----*Atylotus* Osten Sacken, p. 19.
- Eye bare or very sparsely pilose; ocellar tubercle present or absent (frons of female about five times as high as width at base)----- 8
8. Basal callus a swelling at base of a slender raised ridge; a distinct ocellar tubercle present in female; abdomen brownish, with white bands, the apex compressed.-----*Leucotabanus* Lutz, p. 24.
- No basal or median calli or ocellar tubercle present; bright green or yellow species, the abdomen not distinctly compressed apically.-----*Chlorotabanus* Lutz, p. 27.
9. Annulate portion of third antennal segment hairy; no ocellar tubercle; second palpal segment short and stout, with erect hair; proboscis short.-----*Anacimas* Enderlein, p. 28.
- Not agreeing entirely with above, the hair of third antennal segment very inconspicuous if present.----- 10
10. Rather small species with bare or sparsely pilose eye, scarcely any angle, and no dorsal excision on third antennal segment, and frequently a stump vein from vein  $R_4$ .-----*Stenotabanus* Lutz, p. 31.
- Eye bare or pilose, but if a stump vein from vein  $R_4$  is present either the dorsal angle of the third antennal segment is distinct or the eye is densely pilose, or both.-----*Tabanus* Linnaeus, p. 36.

Some difficulty may be experienced in properly placing males in this key, but a little acquaintance with the habitus of the different genera will usually prevent misdetermination.

### The Genus HAEMATOPOTA Meigen

*Chrysozona* Meigen, Nouvelle classification des mouches à deux ailes, p. 23, 1800. (Genotype, *Tabanus pluvialis* Linnaeus.)

*Haematopota* Meigen, Illiger's Mag. f. Insektenkunde 2: 267, 1803; Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten, v. 2, p. 78, 1820; Johnson, Psyche 19: 181-183, 1912. (Genotype, *Tabanus pluvialis* Linnaeus.)

**Generic characters.**—Small, slender, grayish species; eye somewhat pilose; frons very broad and basal callus transverse; first antennal segment one and one-half to three times as long as wide and usually swollen; third with four divisions, the first division with no distinct angle above; wing brown or gray, with hyaline maculations.

Since the status of the names published by Meigen (13) in 1800 is still unsettled, with strong arguments both for and against their use, the writer has preferred to use the name *Haematopota*, as has been customary in this country.

### Key to the Nearctic Species of *Haematopota*

1. Knob of haltere white or pale yellow.-----*americana* Osten Sacken, p. 8.  
Knob of haltere dark brown.----- 2
2. Front tibia distinctly swollen; basal portion of third antennal segment less than twice as long as greatest width.-----*punctulata* Macquart, p. 9.
- Front tibia not swollen; basal portion of third antennal segment more than twice as long as greatest width.-----*rara* Johnson, p. 10.

## HAEMATOPOTA AMERICANA Osten Sacken

(Fig. 1, A)

*Haematopota americana* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 1): 395-396, 1875; Williston, Kans. Acad. Sci. Trans. 10: 135, 1887; Hine, Ohio. at. 5: 231-234, 1904; Johnson, Psyche 19: 182, 1912; Cameron, Bull. Ent. Research 17: 25-26, 1926; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 96, 1931.

Medium sized; apical pale band of wing narrow and not reaching posterior margin; haltere yellow; fore tibia not greatly swollen.

*Female*.—Length 9-11 mm. Eye with short pile. Frons gray, considerably suffused with brown to each side of a slender, median, gray line at vertex, with black hair at vertex and long white hair just above basal callus; a subquadrate, velvety-black spot close to, but not touching, angle formed by basal callus and eye, and a small black fleck midway between vertex and basal callus on median line; distance between eyes at upper angles slightly greater than distance from vertex to top of subcallus and about three-fourths width of basal

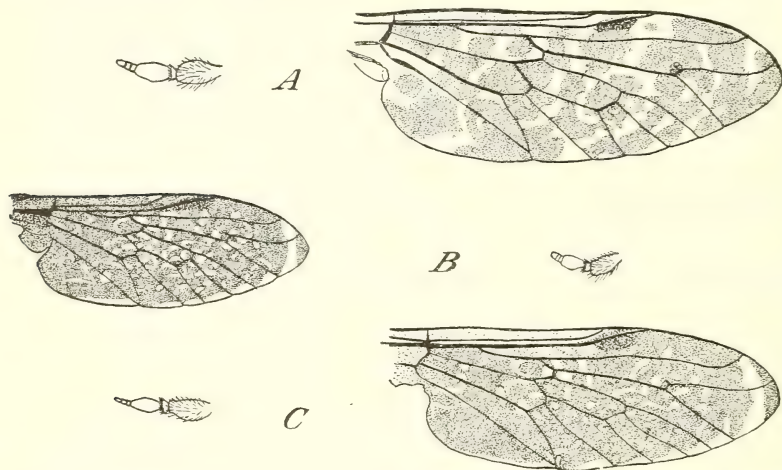


FIGURE 1.—Antenna and wing of (A) *Haematopota americana*, (B) *H. punctulata*, and (C) *H. rara*.

callus; basal callus about five times as wide as median height where the dorsal margin is slightly concave; subcallus yellowish, with a median, velvety, dark-brown spot. Antenna black, the extreme base of third segment orange brown; first segment swollen, one and one-half times to nearly twice as long as thick, with no dorsal excision near apex, the basal half with thin gray pollen, apical half shiny; second very small, with a heavy fringe of black hair; third with basal portion nearly twice as long as wide and apical portion slightly longer than width of basal portion. Clypeus and genae light gray, the upper genae with small black spots not touching frontal callus and only slightly, if at all, confluent near top of spotted area. Second palpal segment very short and stout, cream colored, with concolorous hair. Proboscis only a little longer than palpus.

Mesoscutum dark brown, with three slender gray stripes and also a broader gray stripe from humeral lobe to base of wing; pleura, sternum, and coxae gray, with white hair. Wing pale brownish, with grayish-white maculations; two rosettes distinguishable, one around furcation and one just below and behind it; apical pale band slender and not reaching posterior margin; stump from base of vein  $R_4$ . Haltere pale yellow. Femora gray; tibiae brownish black, with basal third of first tibia yellowish and a basal and a subapical yellow band on each of the others; tarsi dark brownish black, the first segment of each middle and hind tarsus mostly yellow.

Abdomen dark brown above, hind margins of tergites narrowly gray, very small median triangles on tergites 2-5, and round, isolated, sublateral, gray

spots, often very small, on tergites 2 or 3 to 5 or 6, reaching their greatest size on 4 and 5; venter nearly uniformly dark gray.

*Male*.—Eyes actually in contact for only a short distance, densely pilose, the lower facets smaller and the area rather distinctly differentiated from the area of larger facets above; vertex with dense, white hair; frontal triangle white, with a velvety-black median spot extending downward between the antennae. First antennal segment a stout cylinder, its thickness about five-eighths its length, black, with a mixture of long black and white hairs; second segment small, black, with black hair; third black. Genae white, with black spots above, from which arise black hairs; hairs of lower genae and of clypeus white. Palpus stout, narrowed to a blunt apex. Rest of body coloration essentially as in female.

Described from a specimen in the University of Alberta, collected at Roblin, Manitoba, July 8, 1931.

*Type*.—A specimen labelled "type" in a series of five female copotypes, Museum of Comparative Zoology No. 4002, is herein designated as lectotype.

*Type locality*.—Hudson Bay Territory.

*Distribution*.—Central Alaska to New Mexico, Ontario, and Minnesota. June 16 (Roseau County, Minn.) to August 12 (Yellowstone Park, Wyo.). In the United States National Museum, 16 females.

This species has been placed as a synonym, or possible synonym, of *Haematopota crassicornis* Wahlberg. Although it is close to this European species, its pale haltere and the somewhat broader pale maculations on the wing serve to separate it.

#### HAEMATOPOTA PUNCTULATA Macquart

(Fig. 1, B)

*Haematopota punctulata* Macquart, Diptères exotique nouveaux ou peu connus, v. 1, pt. 1, pp. 163-164, 1938; Johnson, Psyche 19: 182, 183, 1912.

Small; dark brown; wing finely maculated with white and apical band rather broad and reaching hind margin; fore tibia strongly swollen; third antennal segment short and stout and first with a distinct, subapical, dorsal notch.

*Female*.—Length 6-7 mm. Eye with short pile. Frons brownish gray, with a rather large, semicircular, velvety-black spot on each side, the angles touching basal callus and eye; median spot very small; a rectangular, brown, denuded spot on median line in contact with basal callus, and partially denuded areas at each side of small median spot; width of frons above about equal to height, but widened below; vertex somewhat depressed; basal callus shiny brown, rugose above, the upper margin excised each side of middle; subcallus yellowish, with a median velvety-black patch. First antennal segment shiny brown, with some thin grayish pollen on inner surface near base, about twice as long as thick, with a distinct, dorsal, subapical depression; third segment dark brownish, the basal portion about two-thirds as broad as long, with a narrowed base but no dorsal angle; annulate portion short, stout and compressed, about as long as width of basal portion. Clypeus and genae gray, with whitish hair, the genae with large brown spots confluent above to form a patch extending from antenna to eye. Second palpal segment creamy white, rather elongate, with a blunt apex and long, sparse, white hair. Proboscis slightly longer than palpus.

Thorax brown, the mesoscutum with three narrow gray lines on anterior margin not reaching more than half way to scutellum. Haltere with brownish knob. Wing uniformly dark brown, with a rather broad, apical, pale band reaching hind margin and many small maculations forming indistinct rosettes; posterior margin narrowly white. Legs brown, the fore tibia considerably swollen, with a subbasal whitish band; middle and hind tibiae only slightly swollen, each with a subbasal and a subapical whitish band; bases of middle and hind tarsi whitish.

Abdomen dark brown, with narrow paler hind margins and very faint, sub-lateral, paler spots on each tergite.

*Male*.—Unknown.



*Type*.—Female, collection unknown.

*Type locality*.—"Carolina."

*Distribution*.—Northeastern Florida. In the United States National Museum, two females.

#### HAEMATOPOTA RARA Johnson

(Fig. 1, C)

*Haematopota rara* Johnson, Psyche 19: 182, 1912; Champlain and Knoll, Ent. News 34: 211, 1923.

Medium sized; basal portion of third antennal segment orange; wing dark, with small white maculations and apical band reaching posterior margin; knob of haltere dark brown.

*Female*.—Length 7–9 mm. Eye sparsely pilose. Frons dark gray tinged with brown, with a rather large, subquadrate, velvety-black spot on each side touching eye and narrowly separated from basal callus, and a small vertical spot of same color on median line slightly above middle; hair of frons sparse, mostly pale; width of frons at vertex about equal to distance on median line from top of the somewhat depressed vertex to top of subcallus; frons widened below from about level of black spots; basal callus black, rugose above, about four times as wide as high, with upper margin excised at each side of middle; subcallus dark brownish black, with a narrow, yellowish, median line; yellowish rims to antennal pits. First antennal segment about twice as long as its greatest vertical thickness, with a shallow dorsal excision near apex, the basal half with thin gray pollen, apical half shiny black; second with blunt dorsal angle; basal portion of third orange, elongate, with scarcely any dorsal angle; annulate portion black. Clypeus and genae light gray, with sparse white hair and black spots, the latter small and few on clypeus but considerably larger on genae and somewhat confluent near upper corners. First palpal segment gray, with small black spots and scattered, long, black hair; second a creamy white, tapering cylinder, slightly more than twice as long as subbasal width, with blunt apex and scattered, long, black hair. Proboscis about length of palpus.

Mesoscutum dark brown, with a slender, median, gray stripe from anterior margin and a pair of broader sublateral stripes, starting just mediad of humeral lobes and all reaching scutellum; humeral lobe gray, with a short gray spot behind it; prescutal lobe brown; pleura and sternum dark gray, with white hair. Wing grayish brown, with a rather broad, whitish, apical band reaching hind margin and many small spots that do not form very distinct rosettes; a short stump from vein  $R_4$ . Coxae gray basally, brown apically; femora dark brown; tibiae brown, the fore tibia with a subbasal yellowish band; tarsi dark brown, the first segment of each middle and hind tarsus yellowish except at apex.

Abdomen dark brown, with gray posterior margins to segments and small, isolated, gray spots on tergites at each side of median line.

*Male*.—Unknown.

*Type*.—Female, Museum of Comparative Zoology No. 7515.

*Type locality*.—Folsom, Delaware County, Pa.

*Distribution*.—Pennsylvania to Virginia. June. In the United State National Museum, one female.

#### The Genus BOLBODIMYIA Bigot

*Bolbodimyia* Bigot, Wien. Ent. Ztg. 11: 162, 1892. (Genotype, *Bolbodimyia bicolor* Bigot.)

*Snowiellus* Hine, Ohio Nat. 5: 230–231, 1904; 10: 151, 1910. (Genotype, *Snowiellus atratus* Hine.) (New synonymy.)

*Generic characters*.—Medium to small, predominantly black species; frons moderately wide, somewhat narrowed above; subcallus strongly swollen and denuded; first antennal segment swollen, at least ventrally; third antennal segment with five divisions, the first elongate, with obtuse dorsal angle; wing largely dark, with extreme apex hyaline; vein  $R_4$  curved abruptly forward apically; tibiae swollen, the hind tibial fringe strong.

A single Nearctic species, *Bolbodimyia atrata* (Hine).

The single genotypic specimen of *Snowiellus atratus* Hine was made available for study through the kindness of the University of Kansas. Although it has the first antennal segment less swollen than have other species of *Bolbodimyia*, it is, in every other respect, particularly in the wing pattern and venation, so like the typical *Bolbodimyia* that it seems inadvisable to consider it generically distinct. In the type specimen the first antennal segment is pointed downward and the second and third strongly upward, accentuating the ventral swelling of the first segment.

**BOLBODIMYIA ATRATA (Hine), new combination**

(Fig. 2, A)

*Snowiellus atratus* Hine, Ohio Nat. 5: 230-231, 1904; 10: 151, 1910.

Rather small; black; wing dark, with a narrow, hyaline, apical margin; subcallus shiny, much swollen.

*Female*.—Length 12 mm. Eye bare. Frons not quite three times as high as width at base, distinctly narrowed above; basal callus large, protuberant, shiny brown, with extensions of the denuded area margining eyes about to top of large, flat, median callus, which joins basal callus by a narrow median con-



FIGURE 2.—Antenna, front view of head, and palpus of (A) *Bolbodimyia atrata* and (B) *Whitneyomyia beatifica*.

nection; some denudation at vertex but no ocellar tubercle; subcallus very swollen, shiny, nearly black. First antennal segment shiny black, with black hair, scarcely swollen above, but distinctly so below, with a tuft of short hair on lower surface; second segment small, black, with a distinct dorsal process; third orange brown, annulate portion darkened; basal portion long and slender, with a short, blunt, dorsal angle; annulate portion nearly as long as basal portion. Clypeus with thin brown pollen except around clypeal pits; genae shiny black. Palpus black, with black hair, the second segment rather slender and curved. Proboscis reaching to apex of fore coxa.

Thorax, legs, and abdomen black, with black hair. Haltere pale brownish. All tibiae slightly swollen, the hind tibial fringe very well developed. Wing dark brownish anterior to middle of cell  $R_5$ , subhyaline posteriorly; extreme apex of wing with crescent-shaped, hyaline margin; base of vein  $R_4$  sharply angulated but with no stump, apical half turned abruptly forward.

*Male*.—Unknown.

*Type*.—Female, in the collection of the University of Kansas.

*Type locality*.—Oak Creek Canyon, Ariz.

*Distribution*.—Known from single specimen collected in July.

**The Genus WHITNEYOMYIA Bequaert**

*Tabanus* subgenus *Whitneyomyia* Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8: 84-85, 1933. (Genotype, *Tabanus beatificus* Whitney.)

*Generic characters*.—Eye bare; no ocelli or ocellar tubercle; frons of female broad, narrowed above; subcallus, clypeus, and genae denuded, the subcallus greatly swollen and clypeus and genae slightly so; first antennal segment not noticeably swollen; third segment slender and attenuate, with five

divisions, the first with a small, obtuse, dorsal angle; wing dark brown; vein *R*<sub>4</sub> not turned abruptly forward apically; tibiae not swollen.

The genotype is the only described species.

Although Bequaert proposed *Whitneyomyia* as a subgenus of *Tabanus*, it seems to deserve generic rank. It lies near *Bolbodimyia*, differing in that the first antennal segment is not distinctly swollen, there is no hyaline margin at apex of wing, vein *R*<sub>4</sub> is not bent forward sharply, and the tibiae are not swollen.

#### WHITNEYOMYIA BEATIFICA (Whitney)

(Fig. 2, B)

*Tabanus ater* Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 101, pl. 2, fig. 5, 1812. (Preoccupied by *Tabanus ater* Rossi.)

*Tabanus lugubris* Macquart, Diptères exotiques nouveaux ou peu connus, v. 1, pt. 1, pp. 145-146, 1838; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 456, 1876; Hine, La. Agr. Expt. Sta. Bull. 93: 51, 1907. (Preoccupied by *Tabanus lugubris* Linnaeus.)

*Tabanus beatificus* Whitney, Canad. Ent. 46: 344-345, 1914.

? *Snowiellus stygius* Enderlein, Mitt. Zool. Mus. Berlin 11: 353-354, 1925.

*Tabanus (Whitneyomyia) beatificus* Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8: 84-85, 1933.

Rather small; shiny black, with black wings; subcallus swollen; third antennal segment elongate.

*Female*.—Length 13-15 mm. Eye bare. Whole body shiny black, with some whitish pollen above and below median callus, a thin coat of grayish pollen along anterior margin of mesoscutum, and, in some specimens, white hair on sides of abdominal tergites 1-3 or 4, leaving a median stripe of black about equal in width to each lateral white stripe. Frons two to two and one-half times as high as width across basal callus, slightly narrowed above; basal callus transverse, strongly protuberant; vertex depressed, with no ocellar tubercle; subcallus strongly protuberant. First antennal segment not swollen; second with a stout dorsal process; third slender, with a short, rectangular, dorsal angle, the basal portion nearly twice as long as wide and the stout annulate portion slightly longer than basal portion. Lower half of clypeus with brownish pollen. First palpal segment small; second moderately stout at base, tapering to a point. Proboscis only slightly longer than palpus. Wing black, without darker spots at furcation and cross veins; cell *R*<sub>5</sub> slightly narrowed apically.

*Male*.—Eye bare or sparsely pilose, the areas of large and small facets distinctly differentiated and the former restricted. Frontal triangle strongly swollen, denuded. Second palpal segment about twice as long as thick, blunt apically. Body coloration essentially as in female.

Described from two males in the United States National Museum from Perry, La., and Gainesville, Fla.

*Type*.—Female, Museum of Comparative Zoology No. 17057.

*Type locality*.—Florida.

*Distribution*.—South Carolina, Georgia, Florida, and Louisiana. April 28 (Florida) to June 16 (Merryville, La.). In the United States National Museum, one female, two males.

As Bequaert has pointed out, it is probable that Enderlein's *Snowiellus stygius* is this species. It may become necessary to consider specimens with the abdomen with entirely black pile as forming a variety distinct from the typical but less common form with white hair laterally, but until more of the latter are found the writer prefers not to do so.

#### The Genus DIACHLORUS Osten Sacken

*Diabasis* Macquart, Histoire naturelle des Diptères, v. 1, p. 207, 1834. (Genotype, *Tabanus bicinctus* Fabricius.) (Preoccupied by *Diabasis Hoffmannsegg* and *Diabasis* Desmarest.)



*Diachlorus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 47, 1876; Ricardo, Ann. Mag. Nat. Hist. (7) 14: 356, 1904; Kröber, Arch. Schiffs u. Trop. Hyg., Bd. 32, Beihefte 2, pp. 35-36, 1928. (Genotype, *Tabanus bicinctus* Fabricius.)

**Generic characters.**—Small, slender, frequently yellow species; ocellar tubercle lacking; first antennal segment one and one-half to three times as long as greatest thickness; second short; third elongate, with five divisions, the first division with scarcely any dorsal angle; second palpal segment moderate in thickness; cell  $R_5$  of wing open; wing usually marked with brown; fore tibia thickened.

*Key to the Nearctic Species of Diachlorus*

1. Base of cell  $R_5$  considerably suffused with brown; fore femur yellow on basal half or more-----*ferrugatus* Fabricius, p. 13.  
Base of cell  $R_5$  hyaline; fore femur entirely black-----*badius* Kröber, p. 14.

**DIACHLORUS FERRUGATUS (Fabricius)**

(Fig. 3, A)

*Chrysops ferrugatus* Fabricius, Systema Antliatorum, p. 111, 1805.

*Tabanus americanus* Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 222, 1813-1820.

*Tabanus ferrugatus* Wiedemann, Diptera Exotica, pt. 1, pp. 94-95, 1821.

*Diabasis atenia* Macquart, Diptères exotiques nouveaux ou peu connus, v. 1, pt. 1, p. 152, 1838; Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 5, p. 271, 1854.



FIGURE 3.—Antenna, front view of head, and palpus of (A) *Diachlorus ferrugatus* and (B) front view of head and palpus of *Diadocera finitima*.

? *Diabasis varipes* Rondani, In Baudi and Truqui, Stud. Ent. 1: 105, 1848.

*Dichelacera ferrugata* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 191, 1848.

*Chrysops approximans* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 198, 1848.

*Chrysops convergens* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, pp. 198-199, 1848.

*Tabanus rondanii* Bellardi, Saggio di ditterologia messicana, pt. 1, pp. 68-69, 1859.

*Diabasis ferrugata* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 1): 396-397, 1875.

*Diachlorus ferrugatus* Osten Sacken, Smithsn. Misc. Collect. No. 270, pp. 55-56, 1878; Ricardo, Ann. Mag. Nat. Hist. (7) 14: 359, 1904; Banks, Ent. News 15: 290-291, 1904; Kröber, Arch. Schiffs u. Trop. Hyg., Bd. 32, Beihefte 2, pp. 36-37, 1928; Bequaert, Jour. N. Y. Ent. Soc. 39: 552-553, 1931.

Small, slender; yellow; wing with broad apical brown spot; base of cell  $R_5$  somewhat infuscated; fore femur largely yellow.

**Female.**—Length 7-10 mm. Eye bare, blue green, with a curved, reddish-purple stripe extending from a short distance below top of frons around to lowest point of eye, and two triangles of same color, one with base on lower frons, the other with base on upper clypeus. Frons yellow, about six times as high as wide, the sides nearly parallel; basal callus a small, brownish, longitudinal spot not touching eyes; median callus a very slender line from basal callus three-fourths of distance to vertex; subcallus yellowish. Antenna yellow orange, apically somewhat blackened by short pile; first segment about one and one-half

times as long as broad, somewhat expanded apically, with pale yellow hair; third elongate, the basal portion rounded above, annulate portion as long as or longer than basal portion. Clypeus and genae grayish, with yellow hair. Second palpal segment yellow orange, tapering to a narrow apex, with a mixture of colorous and black hair.

Thorax yellow, middle portion of mesoscutum tinged with greenish gray, supraepimeron and precoxal area silvery pruinose. Wing subhyaline, with apex beyond end of vein  $R_1$  dark brown, fading behind, base of cell  $R_5$  brown, fading apically, stigma and apex of cell  $R$  brown, costal cell yellow. Legs yellow except fore tibia and tarsus and apices of other tarsi, which are brown; fore tibia distinctly swollen.

Abdomen yellow; a broad, median, dorsal stripe of yellow hair with black hair on each side, so that, in unrubbed specimens, a distinct pale-yellow stripe is evident; venter with yellow hair except at apex.

*Male*.—Unknown.

*Type*.—Female, collection unknown, originally in "Mus. Dom. Bosc."

*Type locality*.—"Carolina."

*Distribution*.—From Delaware to Florida and from Mexico to Brazil. March 29 (Paradise Key, Fla.) to November 23 (Pinellas County, Fla.). In the United States National Museum, 132 females.

It is evident that Palisot de Beauvois' *Tabanus americanus* is a *Diachlorus* and there is little reason to doubt that it is this species, since the figure agrees closely and it is the common species of the Carolinas. Rondani considered his *Diabasis varipes* to be possibly the same as Macquart's *ataenia*. Since there is some doubt about this and since Brazil has a number of species of *Diachlorus*, the identity of *varipes* must remain obscure until the type can be studied.

Banks referred to *Diachlorus ferrugatus* as the "yellow fly of the Dismal Swamp," since it occurs in great abundance in this and other swamps along the southeastern coast of the United States. Its approach is silent, its attack usually confined to the lower part of the body, and its puncture painful. It is remarkable that, in spite of the abundance of this fly, the male is not known.

#### DIACHLORUS BADIUS Kröber

*Diachlorus badius* Kröber, Arch. Schiffs. u. Trop. Hyg., Bd. 32, Beihefte 2, p. 50, 1928.

This species is unknown to the writer. It is apparently close to *Diachlorus ferrugatus*, but the characters mentioned in the key should serve to distinguish it. In addition it apparently differs from *ferrugatus* in having the frons somewhat wider, the basal callus shorter and stouter, and the apical annulus of the antenna somewhat longer.

*Type*.—Female, in the Vienna Museum.

*Type locality*.—Georgia.

#### The Genus DICLADOCERA Lutz

*Dicladocera* Lutz, Inst. Oswaldo Cruz em Manguinhos, p. 29, 1909; Internatl. Hyg. Ausstellung Dresden 1911: 34; Enderlein, Mitt. Zool. Mus. Berlin 11: 384-385, 1925. (Genotype, *Tabanus guttipennis* Wiedemann.)

*Generic characters*.—Stout species of variable size; eye finely pilose; no ocelli or distinct ocellar tubercle; third antennal segment with five divisions, the first with a prominent, forward-pointing, dorsal process.

Key to the Nearctic Species of *Dicladocera*

- |   |   |
|---|---|
| 1. Furcation and cross veins distinctly margined with brown-----  | 2 |
| Furcation and cross veins not distinctly margined with brown-----   | 3 |
| 2. Median callus a very slender line; hair on lateral margin of tergite 4 white; vein $R_{4+5}$ not broadly margined with brown   |   |
| Median callus broadly joined to frontal callus below; hair on lateral margin of tergite 4 entirely black; vein $R_{4+5}$ and other longitudinal veins at base of wing broadly margined with brown             |   |
| <i>finitima</i> , new species, p. 15  |   |
| 3. Conspicuous, light gray, sublateral spots on abdomen   |   |
| <i>megerlei</i> (Wiedemann), p. 16.   |   |
| Abdomen without distinct sublateral spots-----  | 4 |
| 4. Antenna nearly black, the dorsal process of third segment reaching nearly to base of annulate portion but rather short and not curved downward at tip; dorsum of abdomen distinctly darkened medianly----- |   |
| <i>annularis</i> (Hine), p. 17.   |   |
| Antenna mostly orange brown, the dorsal process extending slightly beyond base of annulate portion and rather distinctly turned down at tip; abdomen not noticeably darkened medianly                         |   |
| <i>sexfasciata</i> Stone, p. 18.  |   |

## DICLADOCERA FINITIMA, new species

(Fig. 3, B)

Rather large; dark reddish brown; a brown spot at furcation; median callus very slender; some white hair on lateral margins of tergites.

*Female*.—Length 18 mm. Eye rather densely pilose. Frons not quite three times as high as width at base, slightly narrower just below vertex than elsewhere, grayish brown, with white hair just above basal callus and at vertex, the rest black; basal callus convex, subquadrate, shiny dark brown; median callus a slender, indistinct line about twice as long as basal callus; a partially denuded brown spot at vertex, very slightly raised; subcallus brown, moderately swollen, with some black pile laterally. First antennal segment short and stout, dark brown, with black hair; second with a distinct dorsal process; third (missing). Clypeus and lower genae brown, with concolorous hair, blacker above. Hair of back of head and the postocular fringe creamy white. Second palpal segment moderately stout, dark brown, with black hair.

Dorsum of thorax dark brown, the humeral lobe, prescutal lobe, intrascutal suture, and side behind prescutal lobe orange brown, with white hair, and white hair also on anterior margin of scutum and sides of scutellum; pleura, sternum, and legs dark brown, with brown to black hair, the hind tibial fringe well developed, black. Wing rather whitish basally, hyaline apically, the costal cell pale yellowish and furcation and crossveins margined with pale brown; cell  $R_5$  slightly narrowed apically.

Abdomen above reddish brown, with a median black stripe that widens posteriorly, the whole dorsum rather generally covered with black hair except for creamy-white hairs on posterior lateral corners of second tergite and along whole lateral margin of tergites 3-6; venter black, tinged with reddish medianly, with mostly pale hair, particularly along hind margins of sternites.

*Male*.—Unknown.

*Type*.—Female, United States National Museum No. 51957.

*Type locality*.—Jacksonville, Fla.

The type, collected by Mrs. A. T. Slosson, is somewhat damaged, but since it rather obviously is closely related to *megerlei* (Wiedemann) and at the same time is distinct, as indicated in the key, the species is described at this time in order to make this revision more nearly complete.



## DICLADOCERA MEGERLEI (Wiedemann), new combination

(Fig. 4, A)

*Tabanus megerlei* Wiedemann, Aussereuropaische zweiflügeligen Insekten, v. 1, p. 132, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 457-458, 1876; Williston, Kans. Acad. Sci. Trans. 10: 138, 1887; Hine, La. State Crop Pest Comm. Cir. 6: 38, 1906.

*Tabanus megerlei* Hine, La. Agr. Expt. Sta. Bull. 93: 51, 1907. (Misspelling.)

Rather large, stout; reddish and black; a prominent forward-projecting process on third antennal segment; wing spotted with brown; abdomen with a broad, median, black stripe and no pale hair marginally.

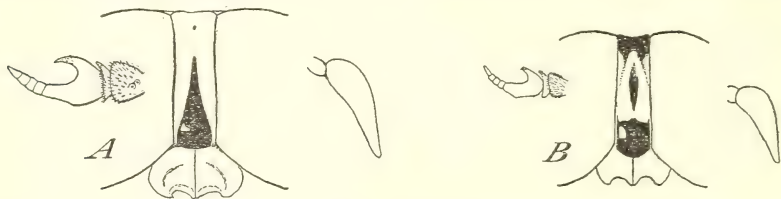


FIGURE 4.—Antenna, front view of head, and palpus of (A) *Di cladocera megerlei* and (B) *D. scita*.

*Female*.—Length 16-20 mm. Eye with sparse, short pile. Frons yellowish brown at vertex and below top of median callus, the space between paler, yellowish gray; vertex occasionally with a dark-brown, triangular, denuded area; frons about three times as high as wide, with nearly parallel sides; basal callus shiny, dark brown, protuberant, not quite touching eyes and forming with median callus an elongate triangle reaching about two-thirds of distance to top of frons; often a denuded, slightly raised area at vertex; subcallus yellowish orange, flattened, with some black hair laterally. Antenna orange, darkened apically, the annulate portion black; first two segments with black hair and second with a distinct dorsal process; third with a prominent, curved, dorsal process reaching forward to base of annulate portion; annulate portion shorter than basal portion. Clypeus and genae orange brown, with dark-brown hair. Second palpal segment moderately stout, tapering to an acute apex, orange brown, with short black hair.

Thorax brownish black, the mesoscutum with three slender, evanescent, grayish stripes, and a broader, reddish stripe from humeral lobe to scutellum. Wing hyaline, the costal cell, basal cells, and area just behind stigma brown, and longitudinal veins basally, furcation, and cross veins margined with brown. Legs orange brown, with black hair.

Abdomen stout, pale reddish gray, with a broad, median, black stripe on dorsum and a fringe of black hair entirely around margin; hair of light portions orange brown, more yellowish on posterior segments.

*Male*.—Unknown.

*Type*.—Female, collection unknown, probably the Vienna Museum.

*Type locality*.—Unknown.

*Distribution*.—Southern North Carolina to Florida and Louisiana. March 21 (Auburndale, Fla.) to April 20 (Southern Pines, N. C.). In the United States National Museum, five females.

## DICLADOCERA SCITA (Walker), new combination

(Fig. 4, B)

*Tabanus scitus* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 181, 1848.

*Tabanus hirticulus* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 5, pp. 53-54, 1855; Osten Sacken, Smithsn. Misc. Collect. No. 270, pp. 277-278, 1878. (New synonymy.)

*Tabanus cerastes* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 462, 1876; Hine, Ohio State Acad. Sci. Spec. Papers 5: 49, 1903. (New synonymy.)

Medium sized; brownish; abdomen with three rows of whitish spots; third antennal segment with a distinct forward-projecting process.

*Female*.—Length 13–16 mm. Eye distinctly pilose, green, with one diagonal bluish band. Frons about five times as high as width at base, distinctly narrowed above, yellow or yellowish gray; basal callus flat, shiny brown, as wide as frons, subquadrate; median callus slender, usually narrowly joined to basal callus, with a more or less distinct, median, depressed line terminating below in a shallow depression; vertex shiny brown but with no ocellar tubercle, and usually somewhat concave; subcallus gray. Antenna orange brown, the annulate portion often darker; first two segments with short black hair; dorsal process of third extending upward and forward so that the distance from base of segment to apex of process is nearly equal to length of basal portion, the extreme dorsoventral width slightly shorter than this; annulate portion rather stout, as long as basal portion. Clypeus and genae white, with white hair. Second palpal segment moderate in width basally, tapering to a slender apex, creamy white, with pale, and sometimes a few black, hairs.

Mesonotum reddish brown, with a mixture of pale and black hairs, the mesoscutum with an indication of pale lines in usual pattern. Pleura, sternum, and coxae white, with white hair. Wing hyaline, the veins dark brown; venation normal. Legs reddish brown, with mostly pale hair, the tarsi and apices of tibiae somewhat darker but not strongly contrasted; hind tibial fringe black and white, the hairs short and inconspicuous.

Abdomen nearly concolorous with mesonotum, with three rows of pale spots; sublateral spots on first and second tergites large, that on second usually extending length of segment and reaching along posterior margin to side; median spot on second tergite a narrow triangle reaching length of segment but completely separated from sublateral spots; on tergites 3–6 the sublateral spots rather small, round, usually completely surrounded by brown, the median triangles small; venter pale, with a faint and narrow, brown, median stripe.

*Male*.—Eye densely pilose, the areas of large and small facets not sharply differentiated; second palpal segment rounded at apex; dorsal process of third antennal segment considerably shorter than in female. Coloration essentially as in female, but abdominal spots considerably smaller.

*Type*.—Female, in the British Museum.

*Type locality*.—Georgia.

*Distribution*.—Wisconsin to Missouri and Maryland to Georgia. May 27 (Falls Church, Va.) to July 9 (Beltsville, Md.). In the United States National Museum, 15 females.

The writer has studied a specimen compared by Hine and stated by him to be conspecific with the type of *scita*, and this example agrees with *Tabanus cerastes* as described by Osten Sacken. The latter examined the type of *hirtioculatus* Macquart and admitted that his *cerastes* was a synonym.

#### DICLADOCERA ANNULARIS (Hine), new combination

(Fig. 5, A)

*Tabanus annularis* Hine, Ohio Jour. Sci. 17: 269, 1917.

Small but stout; brownish; frontal callus black; abdomen with narrow, pale bands.

*Female*.—Length 10–12 mm. Eye with dense, short pile. Frons yellowish, about three times as high as width at base, slightly narrowed above; vertex shiny black, with a median depression, but no ocellar tubercle; basal callus shiny black, distinctly convex, as wide as frons, with median depression above; median callus a slender black line separated from spot at vertex and from basal callus; subcallus somewhat swollen, pale gray. Antenna dark reddish brown, annulate portion black; first two segments gray, with black hair; basal portion of third with distinct angle below and a prominent forward-projecting process above, reaching to base of annulate portion; distance from

tip of dorsal process to ventral angle slightly greater than length of basal portion, and about equal to length of annulate portion; dorsal process and tip of annulate portion with short black hair; annulate portion rather stout, the divisions distinct. Clypeus and genae nearly white, with white hair. Second palpal segment slender, tapering to a narrow apex, white, with black and white hair.

Mesoscutum and scutellum dark brown, with black and yellowish-brown hair, the former with an indication of paler lines; prescutal lobe paler. Pleura, sternum, and coxae gray tinged with yellow, the hair white. Wing hyaline, with costal cell brownish, venation normal, veins dark brown. Femora and tibiae orange brown, the apical third of fore tibia and apices of others darker; tarsi dark reddish brown to black.

Abdomen dark reddish brown above, the median third black; each tergite on posterior margin with a band of yellowish-gray pollen and hair, which widens slightly laterally and on second tergite forms a median triangle extending as a narrow line to anterior margin; venter almost entirely pale yellowish.

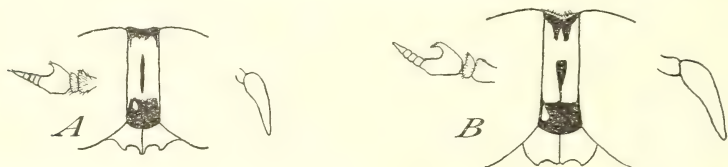


FIGURE 5.—Antenna, front view of head, and palpus of (A) *Dicladocera annularis* and (B) *D. sexfasciata*.

*Male*.—Areas of large and small facets of eye distinctly differentiated; first antennal segment with long black hair above; second palpal segment yellow, with black hair. Body generally darker than in female, the legs black except for basal halves of tibiae.

*Type*.—Male, in the collection of Ohio State University.

*Type locality*.—Ocean Springs, Miss.

*Distribution*.—Mississippi. April 18 (Ocean Springs) to May 5 (Lucedale). In the United States National Museum, one female.

#### DICLADOCERA SEXFASCIATA Stone

(Fig. 5, B)

*Dicladocera sexfasciata* Stone, Ent. Soc. Wash. Proc. 37: 11–12, 1935.

Medium sized, stout; brown; wing hyaline; abdomen dark brown, with yellow posterior margins to the tergites and a narrow, median, yellow line on second tergite; third antennal segment with a prominent forward-projecting process above.

*Female*.—Length 15 mm. Eye sparsely pilose, green, with a narrow, diagonal, purple band. Frons yellowish gray, a little more than three times as high as width at basal callus, slightly narrowed above; vertex depressed, a denuded area just anterior to it, but no ocellar tubercle; basal callus chestnut brown, rectangular, slightly broader than high; median callus slender and small, narrowly joined to basal callus; subcallus light gray, somewhat protuberant. First two antennal segments light orange brown, with black hair; third darker orange brown, the annulate portion nearly black; basal portion with a prominent forward-projecting process from dorsal surface basally, the process reaching a little beyond base of annulate portion and slightly turned down apically; ventral margin slightly angulate near distal third; annulate portion a little shorter than basal portion. Clypeus and genae nearly white, with white hair. Palpus nearly as long as proboscis, the second segment slightly swollen basally and tapered apically, pale cream colored, with white and a few black hairs.

Mesoscutum brownish gray; a broad, median, nearly black stripe, faintly divided medianly by a paler brown line, extending from anterior margin two-thirds of way to scutellum; posterior to this a narrow, brown, median stripe reaching to scutellum; laterad of median stripe a black stripe, broken on transverse suture, narrowing behind, and nearly reaching scutellum, the posterior portion surrounded by a brown area; prescutal lobe with coarse black hair;



pale-yellow hair above wing base; scutellum entirely dark brown. Pleura and coxae yellowish gray, with white hair. Wing hyaline, the costal cell and margin of vein  $R_{4+5}$  brown; venation normal. Legs orange brown, fore tibia apically and tarsi darker; hair of legs mostly yellowish brown, the hairs of hind tibial fringe short and sparse.

Abdomen dark brown, with narrow, light-yellowish-gray bands on hind margins of tergites 1-6, the first band slightly wider than others; second tergite with a median triangle of same color, narrow anteriorly and nearly reaching anterior margin; venter brownish gray, with median dark spots anteriorly on sternites 3-7.

*Male*.—Unknown.

*Type*.—Female, Ohio State University. Paratype, United States National Museum No. 50612.

*Type locality*.—Largo Key, Pinellas County, Fla.

*Distribution*.—Duval and Pinellas Counties, Fla. March 4 (Largo Key) to March 8 (Gulfport). In the United States National Museum, one female.

### The Genus *ATYLOTUS* Osten Sacken

*Atylotus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4) : 426, 1876. (Genotype, *Tabanus bicolor* Wiedemann.)

*Ochrops* Szilády, Ent. Mitt. 4 : 93, 1915. (Genotype, *Tabanus plebejus* Fallen.)

*Dasystypia* Enderlein, Mitt. Zool. Mus. Berlin 10 : 347-348, 1922. (Genotype, *Tabanus rusticus* Linnaeus.)

*Generic characters*.—Small yellowish or grayish species; eye pilose and usually with a single, diagonal, purplish band; large and small facets in eye of male moderately to sharply differentiated; no ocellar tubercle; median and basal calli absent or much reduced; second palpal segment of female stout basally.

Although this was originally proposed as a subgenus of *Tabanus*, it is the writer's opinion that the characters are sharply enough defined to warrant generic status. The genus *Ochrops* Szilády, based upon *T. plebejus* Fallen and related species, was correctly placed as a synonym of *Atylotus* by Enderlein. Kröber (8) placed *T. tricolor* Zeller and related species under *Atylotus*, but improperly, for *tricolor* is the type of the genus *Theriopectes* Zeller and is very different from *T. bicolor* Wiedemann.

#### Key to Females of Nearctic Species of *Atylotus*

1. Antenna black; tibiae bicolored-----*pygmaeus* (Williston), p. 20. 2  
    Antenna yellow to brown; tibiae unicolorous----- 2
2. Frons with no denuded calli----- 3  
    Frons with one or more small, denuded calli  
        *insuetus* (Osten Sacken), p. 20.
3. Pleura yellow-----*bicolor* (Wiedemann), p. 22. 4  
    Pleura gray----- 4
4. Pale hair of abdomen white; frons moderate in width; basal portion of third antennal segment stout, with dorsal angle prominent and near middle of length-----*ohioensis* (Hine), p. 22.  
    Pale hair on dorsum of abdomen bright yellow; frons usually rather narrow; basal portion of third antennal segment moderately elongate, the dorsal angle slight and basad of middle----- 5
5. Pale hair of venter nearly white; palpus with abundant black hair; usually over 10 mm in length-----*pemeticus* (Johnson), p. 23.  
    Pale hair of venter as yellow as hair of dorsum; palpus with long white hair predominant, the black hair sparse; usually under 10 mm in length-----*thoracicus* (Hine), p. 24.

Suitable characters for use in a key to separate the males have not been discovered, but in most cases the coloration and general appearance will serve to associate them with their females.

**ATYLOTUS PYGMAEUS (Williston), new combination**

(Fig. 6, B)

*Tabanus pygmaeus* Williston. Kans. Acad. Sci. Trans. 10: 141, 1887; Philip, Bull. Brooklyn Ent. Soc. 31: 194, 1936.

Small; blackish; abdomen above with three rows of gray spots; basal callus very small; third antennal segment with only two distinct annuli.

*Female*.—Length 7–9 mm. Eye green on upper half, purple below, with sparse, short pile. Frons dark brown, about three times as high as wide, with nearly parallel sides; basal callus indistinct, sometimes entirely covered with pollen and never very much denuded; no median callus; sometimes a small tubercle at vertex; subcallus and upper genae concolorous with frons. Antenna dark brownish black, the basal portion of third segment about two-thirds as long as broad, with a rounded angle beyond middle of dorsal margin and a convex ventral margin; annulate portion short and stout, shorter than width of basal portion, with two distinct annuli and an indication of a third. Clypeus and lower genae white, with white hair. Palpus creamy white, the second segment moderately stout at base, tapering to a slender apex, with white and a few black hairs.

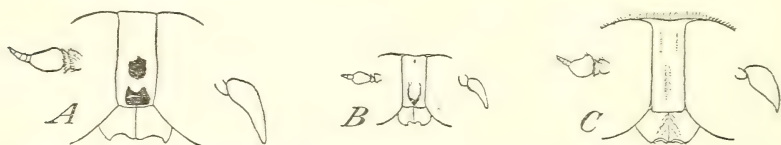


FIGURE 6.—Antenna, front view of head, and palpus of (A) *Atylotus insuetus*, (B) *A. pygmaeus*, and (C) *A. bicolor*.

Mesonotum dark brown, the mesoscutum with three narrow grayish stripes. Pleura, sternum, and coxae brownish gray, with concolorous hair. Wing hyaline, the stigma brownish; venation normal. Femora brownish black; tibiae whitish basally, dark brownish apically, the brown more extensive on fore tibia than on others; tarsi black, the first segment of middle and of hind tarsus pale.

Abdomen dark brown, with a median row of small gray triangles and larger, oblique, sublateral, gray spots which reach hind and lateral margins of tergites; venter mostly grayish.

*Male*.—Described by Philip but not seen by the writer.

*Type*.—Female, University of Kansas.

*Type locality*.—Florida.

*Distribution*.—Delaware to Florida. June 11 (Nassau, Del.) to August 22 (Lloyd, Fla.). In the United States National Museum, one female.

**ATYLOTUS INSUETUS (Osten Sacken)**

(Fig. 6, A)

*Tabanus insuetus* Osten Sacken, U. S. Geol. and Geogr. Survey Terr. Bull. 3: 219, 1877; Hine, Ohio Nat. 5: 238, 1904; Webb and Wells, U. S. Dept. Agr. Dept. Bull. 1218: 26–29, 1924; Cameron, Bull. Ent. Research 17: 30–31, 1926; Rowe and Knowlton, Canad. Ent. 67: 242, 1935; Philip, Canad. Ent. 68: 158–159, 1936.

*Atylotus insuetus* Osten Sacken, Smithsn. Misc. Collect. No. 270, p. 62, 1878.

*Tabanus utahensis* Rowe and Knowlton, Canad. Ent. 67: 242, 1935. (New synonymy.)

*Tabanus insuetus* var *tingaureus* Philip, Canad. Ent. 68: 159–160, 1936. (New synonymy.)

Rather small; body coloration variable, yellowish or grayish; palpus yellowish to white; basal and median calli present, but former somewhat reduced so that it touches neither eyes nor subcallus.

*Female*.—Length 12 mm. Eye with short, fine pile, pale yellowish green, with a narrow, diagonal, purplish band from inner lower angle. Frons gray, tinged with yellow, with black and pale-yellowish hair, two and one-half times as high as wide, with nearly parallel sides; basal and median calli shiny



black; basal callus slightly wider than high, irregular, narrowly separated from subcallus and rather broadly so from eyes; median callus irregular, subquadrate, nearly as wide as basal callus; subcallus slightly protuberant, the ground color yellowish, with thin concolorous pollen. Antenna yellowish orange, the annulate portion slightly darker; first two segments with black hair; basal portion of third not excised dorsally; a few black hairs just basad of the obtuse dorsal angle; annulate portion stout, slightly shorter than basal portion. Clypeus and genae concolorous with frons, with mostly concolorous hair. Palpus pale yellowish, with mixed black and pale-yellowish hair; second segment stout basally, tapering to acute apex; proboscis not much longer than palpus.

Mesonotum, including prescutal lobe, black, with erect black and recumbent yellowish hair. Pleura, sternum, and coxae grayish tinged with yellow, the hair pale yellowish. Wing hyaline, the veins yellowish brown basally, dark brown apically; vein  $R_4$  angulate basally, the stump vein scarcely evident. Femora dark grayish brown; tibiae and tarsi yellowish brown, the fore tibia apically and fore tarsus dark brownish black.

Abdomen dark grayish brown, faintly yellowish on sides of second tergite; median and sublateral spots of paler hair scarcely visible.

*Male*.—Eye densely pilose, the areas of large and small facets rather well differentiated along the narrow, diagonal, purple band; pollen and hair of head gray, scarcely tinged with yellow; second palpal segment stout, the apex acute and slightly turned downward. Body coloration essentially as in female. Vein  $R_4$  with a moderate stump.

*Type*.—One of nine cotype females in the Museum of Comparative Zoology (No. 14518) labeled and herein designated as lectotype. One cotype in the collection of C. B. Philip.

*Type locality*.—Webber Lake, Calif.

*Distribution*.—Southern Alaska and Saskatchewan to central California and Colorado. May 18 (Dolomite, Utah) to September 10 (Topaz, Calif.). In the United States National Museum, 54 females, 10 males.

The foregoing descriptions are based upon the lectotype and a male in the collection of C. B. Philip very closely resembling the lectotype. These descriptions will not fit accurately the many tinctorial and structural variations occurring in this species or species complex. Osten Sacken noted certain variations in the type series; Hine referred to the extremely variable nature of the species; Philip also discussed this variability and named a variety; *utahensis* Rowe and Knowlton is, the writer feels, at most a variety. The coloration of "*insuetus*" varies all the way from the pale, dusty yellowish of *utahensis* to specimens even darker than the type; the pleural hair may be strongly orange brown as in the variety *tingaureus*, yellow as in certain specimens from Topaz, Calif., or nearly white as in some specimens from Colorado; the abdomen may be entirely unicolorous, distinctly paler laterally, or may have three rows of distinct, pale spots; the prescutal lobe ranges from black to pale yellow; the femora show the same variation; the third antennal segment may be entirely yellow, yellow with the annulate portion black, or entirely dark brownish. Structurally the frons may be as broad as in the type or considerably narrower; the stump vein from  $R_4$  may be absent or long; the frontal calli vary considerably in size and may or may not be connected.

With all of the variation mentioned, it would seem possible to select one or more characters to delimit varieties or even species. With some 150 specimens at hand, however, the writer has been unable to do so, there being intergradation or overlapping of both structural and tinctorial characters throughout. It is possible that suitable

characters may be found, and certainly the two forms already named show relatively constant color differences from the typical form. However, any segregation based on color exhibits considerable structural variation and the converse. Until more collecting can be done and further study made on the seasonal, climatic, and geographic distribution of the forms the writer prefers to place them all under the one name, freely admitting that this is not the final solution of the problem.

**ATYLOTUS BICOLOR (Wiedemann)**

(Fig. 6, C)

*Tabanus bicolor* Wiedemann, *Diptera Exotica*, pt. 1, p. 96, 1821; Osten Sacken, *Mem. Boston Soc. Nat. Hist.* 2 (pt. 4, No. 4): 460, 1876; Hine, *Canad. Ent.* 32: 247, 1900; Ohio State Acad. Sci. Spec. Papers 5: 48, 1903; Stone, *Ann. Ent. Soc. Amer.* 23: 296-297, 1930.

*Tabanus fulvescens* Walker, *List of the Specimens of Dipterous Insects in the Collection of the British Museum*, pt. 1, p. 171, 1848; Osten Sacken, *Smithsn. Misc. Collect.* No. 270, pp. 62, 229, 1878.

*Tabanus ruficeps* Macquart, *Diptères exotiques nouveaux ou peu connus*, sup. 5, p. 55, 1855; Osten Sacken, *Smithsn. Misc. Collect.* No. 270, p. 62, 1878.

*Atylotus bicolor* Osten Sacken, *Smithsn. Misc. Collect.* No. 270, p. 62, 1878.

Small; yellow; abdomen above often darkened medianly; eye pilose; no frontal calli.

*Female*.—Length 10-13 mm. Eye finely pilose, with a narrow, diagonal, dark line from lower inner angle, often showing even in dried specimens. Whole body orange yellow, the mesonotum, and a broad median line on abdomen which widens posteriorly, somewhat darker and grayer. Head with yellow hair. Frons about three times as high as wide, with parallel sides; no ocellar tubercle or basal or median callus. Antenna uniformly yellow; third segment short and stout, width of basal portion about equal to length, with no dorsal excision, but dorsal angle prominent; annulate portion slightly shorter than basal portion. Second palpal segment short, very stout at base, tapering to an acute apex; hair long, yellow, with a few scattered black ones. Proboscis yellow, only slightly longer than palpus.

Wing hyaline, the veins yellow; costal cell and base of wing slightly tinged with yellow; venation normal. Legs yellow, the tarsi sometimes slightly darker; no hind tibial fringe, although there are some scattered dark hairs on tibiae.

*Male*.—Eye not flattened above, the area of large facets rather sharply differentiated from the area of small facets, the latter extending around top of eye in a rather broad band. Second palpal segment stout, with blunt apex. Coloration of body as in female.

*Type*.—Male, collection unknown, perhaps Vienna Museum.

*Type locality*.—North America.

*Distribution*.—Alberta to New Mexico and east to Ontario, Maine, and the District of Columbia. June 30 (McLean, N. Y.) to August 28 (Block Island, R. I.). In the United States National Museum, 12 females, 7 males.

**ATYLOTUS OHIOENSIS (Hine), new combination**

(Fig. 7, A)

*Tabanus pruinus* Hine, *Canad. Ent.* 32: 248, 1900. (Preoccupied by *Tabanus pruinus* Bigot.)

*Tabanus ohioensis* Hine, *Canad. Ent.* 33: 28, 1901; Ohio State Acad. Sci. Spec. Papers 5: 53, 1903.

Small; almost uniformly gray or brownish black, the venter and at least base of femora gray.

*Female*.—Length 8.5-10 mm. Eye with rather dense, yellowish pile. Frons, subcallus, clypeus, and genae pale yellowish, somewhat grayed below. Frons



about two and one-half times as high as wide, the sides parallel; no calli or ocellar tubercle. First two antennal segments yellow, with yellow and sometimes blackish hair; third orange yellow, short and stout basally, with a blunt dorsal angle and no excision, the basal portion three-fourths as broad as long to as broad as long; annulate portion short and stout, with only three distinct annuli. Palpus yellow, second segment stout, with a rather blunt apex and long, erect, yellow, and blackish hair.

Thorax and coxae dark gray, with whitish hair. Wing hyaline, with yellowish veins; venation normal. Legs yellowish brown, with yellowish and blackish hair; all femora somewhat darkened at base.

Abdomen nearly uniformly brownish black, the sides of tergites 1 and 2 sometimes yellowish brown.

*Male*.—Eye densely pilose, the areas of large and small facets rather distinctly differentiated. Coloration essentially as in female, but sides of tergites 1-3 nearly always yellowish.

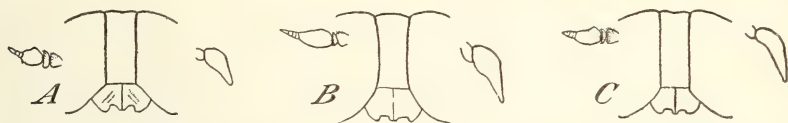


FIGURE 7.—Antenna, front view of head, and palpus of (A) *Atylotus ohioensis*, (B) *A. pemeticus*, and (C) *A. thoracicus*.

*Cotypes*.—Five males and three females, Ohio State University and United States National Museum No. 5339.

*Type locality*.—Ohio.

*Distribution*.—Iowa to New York. June 8 (Lafayette, Ind.) to July 31 (McLean, N. Y.). In the United States National Museum, four females, eight males.

#### ATYLOTUS PEMETICUS (Johnson), new combination

(Fig. 7, B)

*Tabanus pemeticus* Johnson, Boston Soc. Nat. Hist. Occas. Papers 5: 11-12, 1921.

Rather small; brownish; pleura grayish; palpal hair predominantly black; no frontal calli.

*Female*.—Length 10-13 mm. Eye with short pile and a narrow, purplish, diagonal stripe. Frons yellowish brown, with mostly black hair, three to nearly four times as high as wide, with no calli or ocellar tubercle. Subcallus concolorous with frons, somewhat flattened. First two antennal segments yellow, with black hair; third yellow orange, the dorsal angle distinct but obtuse basad of middle; annulate portion slightly shorter than width of basal portion. Clypeus and genae grayish, with white hair, at least the upper genae tinged with yellow. Palpus pale yellowish to white, the hair of first segment mostly white, of second mostly black; second stout basally, tapering to acute apex. Proboscis yellowish to brown.

Dorsum of thorax blackish brown, with erect black hair and recumbent yellowish hair; prescutal lobe paler brownish. Pleura, sternum, and coxae gray, with white hair. Wing hyaline; costal cell pale yellowish; veins apically dark brown; vein R, usually angulate basally or with a stump vein. Legs yellowish brown, with black hair, the fore tarsus darkened apically.

Abdomen dark brown above, somewhat yellower on sides of first two tergites, with black and yellow-orange hair; venter paler, gray at least basally, with the hair white or pale yellowish.

*Male*.—Eye densely pilose, the areas of large and small facets well differentiated; second palpal segment rather stout, the apex acute. Femora black, somewhat yellowish apically; apex of fore tibia and fore tarsus blackish. Coloration otherwise essentially as in female.

*Type*.—Female, in the collection of the Boston Society of Natural History. Allotype and two paratypes in the collection of the Boston

Society of Natural History; paratype in the Museum of Comparative Zoology.

*Type locality*.—Southwest Harbor, Maine.

*Distribution*.—Minnesota and Newfoundland to Indiana and Connecticut. June 19 (Lyme, Conn.) to September 9 (Southport, Maine). In the United States National Museum, eight females, four males.

**ATYLOTUS THORACICUS (Hine), new combination**

(Fig. 7, C)

*Tabanus thoracicus* Hine, Canad. Ent. 32: 248, 1900.

Small; pleura gray; pale hair of sides of abdomen bright yellow; no frontal calli.

*Female*.—Length 9–11 mm. Eye pilose. Frons pale yellowish, with yellow hair, three to four times as high as wide, with parallel sides and no denuded basal or median callus; subcallus pale brownish yellow. First two antennal segments yellow, with black hair, the second with a pronounced dorsal process; third segment orange, the basal portion stout, with a prominent, obtuse, dorsal angle and no dorsal excision; annulate portion stout, indistinctly four-segmented, slightly shorter than width of basal portion. Clypeus and genae gray, with white hair. Second palpal segment whitish, distinctly swollen basally but tapering to a slender apex; hair erect, a mixture of black and white. Proboscis yellow, not much longer than palpus.

Thorax gray, the dorsum with mostly yellow hair, pleura and sternum with whitish hair. Wing hyaline, with yellow veins and usually without a stump from vein R<sub>4</sub>. Coxae gray; rest of legs yellow, with mostly black hair, the femora basally often gray.

Abdomen above dull yellow, with yellow hair, the sides of first few segments paler yellow; venter yellow, the extreme base often somewhat gray.

*Male*.—Eye pilose, the areas of large and small facets rather distinctly differentiated. Postorbital hairs near vertex intensely yellow. Second palpal segment moderately stout. Coloration of whole body essentially as in female, but genae usually yellower and abdomen grayer midventrally.

*Type*.—A lectotype female, United States National Museum No. 5340, selected and herein designated from a male and a female cotype in the United States National Museum and a female cotype at the Ohio State University.

*Type locality*.—Oswego, N. Y.

*Distribution*.—Wisconsin to Ontario and Delaware. June 8 (North Mountain, Pa.) to August 1 (Oswego, N. Y.). In the United States National Museum, two females, five males.

**The Genus LEUCOTABANUS Lutz**

*Leucotabanus* Lutz, Brazil-Medico 27 (45): 487, 1913. (Genotype, *Tabanus leucaspis* Wiedemann.)

*Generic characters*.—Small to medium sized; eye bare or sparsely pilose; frons of female very narrow, with a small basal callus forming a swelling at base of a long, slender, median callus; ocellar tubercle present; third antennal segment with five divisions, the first with a distinct dorsal angle; thorax usually with dense white hair; abdomen brownish to black, with white bands, apex distinctly compressed.

*Key to the Nearctic Species of Leucotabanus*

1. Length 10–12 mm; antenna orange, femora reddish----*annulatus* (Say), p. 25.  
Length 15–18 mm; antenna and femora black----*ambiguus*, new species, p. 26.



## LEUCOTABANUS ANNULATUS (Say), new combination

(Fig. 8, A)

*Tabanus annulatus* Say, Jour. Acad. Nat. Sci. Phila. 3: 32-33, 1823; Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, p. 185, 1828; Say, Complete Writings, Le Conte ed., v. 2, p. 53, 1859; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (sup.): 555-556, 1878; Hine, Ohio Nat. 5: 234, 1904; La. Agr. Expt. Sta. Bull. 93: 43-44, 1907; Jones and Bradley, Jour. Econ. Ent. 16: 310-311, 1923; Schwardt, Jour. Kans. Ent. Soc. 4: 10, 1931; Ark. Agr. Expt. Sta. Bull. 332: 26, 1936.

Small; generally pale, the femora reddish; abdomen of female banded, of male largely white; thorax of male with dense white hair.

*Female*.—Length 10-12 mm. Eye bare, or nearly so. Frons, subcallus, and top of genae orange brown; most of clypeus and lower part of genae light gray, with white hair. Frons five to six times as high as width at narrowest point, which is slightly above basal callus; basal callus brown, about one-half width



FIGURE 8.—Antenna, front view of head, and palpus of (A) *Leucotabanus annulatus* and (B) *L. ambiguus*.

of frons, longitudinal, forming a swelling at base of a long, narrow, brown line, the latter reaching to upper third of frons; just below vertex a small ocellar tubercle, sometimes denuded and shiny, sometimes pollinose. Antenna nearly uniformly orange brown; first and second segments with black hair; basal portion of third without excision beyond dorsal angle, which is prominent and slightly obtuse; annulate portion slightly longer than basal portion. Second palpal segment slender, with only a slight angle at base, pale yellowish, with black and white hair.

Mesoscutum reddish or orange brown, with white pollen and yellowish-orange and white hair; hair of scutellum predominantly white. Pleura and sternum whitish, with white hair. Wing hyaline, with brown veins; venation normal. Femora reddish brown; tibiae white, with white hair except apical fourth of anterior tibia and tips of others, which are brown, with brown hair; tarsi brown, the first segment of middle tarsus with some white hair.

Abdomen above reddish brown, with hind margins of segments pale; in well preserved specimens the hair on each tergite forming a wide anterior band of dark brown, a narrow band of yellow, widest medianly, and a very narrow posterior fringe of white; venter colored like dorsum, the base somewhat paler; tip of abdomen compressed.

*Male*.—Areas of large and small facets of eye distinctly differentiated, the latter in a narrow band that extends around margin to vertex. Second palpal segment pointed at tip, the hair long and white. Body, particularly thorax, densely clothed with white hair, brown hair absent.

*Type*.—Lost.

*Type locality*.—Missouri.

*Distribution*.—Southeastern part of the United States from Kansas to Delaware and Texas to Florida. May 6 (Magnolia, Fla.) to July 26 (Ship John Lighthouse, Delaware River, Del.). In the United States National Museum, nine females, seven males.

## LEUCOTABANUS AMBIGUUS, new species

(Fig. 8,B)

*Tabanus albiscutellatus* Hine (not Macquart) (in part), Mich. Univ. Mus. Zool. Occas. Papers 162: 34, 1925.

Medium sized; reddish brown, with mostly white hair; antenna black; wing hyaline; abdomen with broad white bands, femora black; tibiae mostly white.

*Female*.—Length 16 mm. Eye with sparse, short pile. Frons yellowish gray, slightly over five times as high as wide, with nearly parallel sides; basal and median calli forming a narrow brown line, tapering above and reaching from subcallus three-fourths of distance to the distinct, dark-brown, ocellar tubercle; subcallus concolorous with frons, slightly protuberant. Antenna black; first segment not greatly enlarged; second with strong dorsal process; both with black hair; third with basal portion considerably shorter than the long, slender, annulate portion, the dorsal angle strong and excision moderate. Clypeus and genae gray except for brown at upper margin, with white hair. Second palpal segment yellowish brown, with a frosted appearance and black and white hair, rather broad at base and tapering apically.

Mesoscutum reddish brown, with thin gray pollen and white hair; four paler stripes evident, at least anteriorly; humerus, prescutal lobe, and apex of scutellum somewhat paler. Pleura, sternum, and coxae gray, tinged with reddish above, with pale hair. Wing hyaline, veins mostly dark brown; venation normal. Femora, tibiae apically, and tarsi black; basal two-thirds of fore tibia and somewhat more of other tibiae white.

Abdomen above dark reddish brown, with posterior margin of second tergite and most of fourth tergite white haired; third tergite with a little white hair posteriorly; venter dark brown, the second and fourth sternites each with a pale band on hind margin.

*Male*.—Eye bare, the areas of large and small facets strongly differentiated, the former extensive, and top of head distinctly flattened. Second palpal segment stout, creamy white, with long white hair. Thorax densely white haired, especially posteriorly and below. Abdomen reddish brown, darker apically, the second tergite entirely white, third and fourth with broad white bands on hind margins; ventral bands not quite so wide.

*Type*.—Female, in the Museum of Comparative Zoology. Paratypes, two males in the same collection, one female and two males in the collection of Ohio State University, and one female and one male in the United States National Museum (No. 51958).

*Type locality*.—Palmerlee, Ariz.

Type collected July and two paratypes, same data; other paratypes from Hereford, Ariz. (H. Hereford); Garces, Ariz.; Carr Canyon, Huachuca Mts., Ariz., August 1905 (H. Skinner); Santa Rita Mountains, Ariz., July (F. H. Snow); Arizona.

Under the name *Tabanus albiscutellatus* Macquart, Hine described two females from Guatemala and one male and one female from Arizona. The two females from Guatemala represent one species, the pair from Arizona another, and neither is *albiscutellatus* Macquart if, as seems probable, Kröber (11) is correct in placing *albiscutellatus* as a synonym of *leucaspis* Wiedemann; nor does either of the species misidentified by Hine agree perfectly with Walker's description, or with Kröber's redescription, of *T. uncinatus*, a synonymy suggested by Kröber (11). The Arizona species is here described as new, and the Guatemala species left unnamed for the present.

The Genus *CHLOROTABANUS* Lutz

*Chlorotabanus* Lutz, Inst. Oswaldo Cruz em Manguinhos, p. 30, 1909; Internatl. Hyg. Ausstellung Dresden, 1911: 35; Brazil-Medico, 27 (45): 487, 1913; Mem. Inst. Oswaldo Cruz 6: 71, 167, 1914; Kröber, Zool. Anz. 87: 14-15, 1930. (Genotype, *Tabanus mexicanus* Linnaeus.)

*Ommallia* Enderlein, Deut. Ent. Ztschr. 1923: 545; Mitt. Zool. Mus. Berlin 11: 388, 1925. (Genotype, *Ommallia viridis* Enderlein=*Tabanus inanis* Fabricius.)

**Generic characters.**—Rather small, stout, yellow or green; no ocelli, ocellar tubercle, frontal callus, or median callus; first antennal segment about as long as thick; third with five divisions, the first with a distinct dorsal angle but no forward-projecting process; palpus not unusually stout; short stump from vein  $R_4$  usually present.

This genus is placed as a subgenus of *Tabanus* by Kröber (11) in his catalog, but it is the present writer's opinion that *T. mexicanus* and related species form a group that is sufficiently well defined and striking to deserve generic rank.

There is a single Nearctic species, *Chlorotabanus crepuscularis* (Bequaert).

## CHLOROTABANUS CREPUSCULARIS (Bequaert)

(Fig. 9, A)

*Tabanus sulphureus* Palisot de Beauvois (in part), Insectes recueillis en Afrique et en Amerique, p. 222, 1813-1820.

*Tabanus flavus* Macquart, Histoire Naturelle des Diptères, v. 1, pp. 200-201, 1834. (Preoccupied by *Tabanus flavus* Wiedemann.)

*Tabanus mexicanus* of authors (not Linnaeus) (in part), Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 459-460, 1876; Hine, La. Agr. Expt. Sta. Bull. 93: 52, 1907; Jones and Bradley, Jour. Econ. Ent. 17: 48, 1924; Schwardt and Hall, Ark. Agr. Expt. Sta. Bull. 256: 26, 1930.

*Tabanus crepuscularis* Bequaert, Harvard Inst. Trop. Biol. Med. 4: 234, 1926.

*Tabanus* (*Chlorotabanus*) *crepuscularis* Kröber, Rev. Ent. 4: 296, 1934.

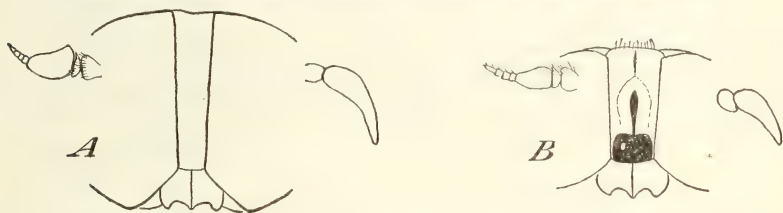


FIGURE 9.—Antenna, front view of head, and palpus of (A) *Chlorotabanus crepuscularis* and (B) *Anacimas dodgei*.

Rather small, stout; pale greenish yellow; frons narrow; no frontal calli.

**Female.**—Length 13-15 mm. Eye bare. Whole body pale yellow, in fresh specimens the antenna, proboscis, femora, and most of abdomen bright green. Frons very narrow, more than five times as high as width at base, somewhat widened above, without ocellar tubercle or calli. Basal portion of third antennal segment large, width at base about three-fifths its length, dorsal angle prominent, a shallow excision directly distad of angle and a slight convexity just basad of annulate portion; ventrally not strongly convex; length of annulate portion equal to greatest width of basal portion. Second palpal segment rather elongate, decidedly tapering, about two-thirds length of proboscis.

Wing hyaline, the costal cell yellowish; veins yellow; rather faint brown spots at furcation and on cross veins; vein  $R_4$  with short stump; cell  $R_5$  wide open; no spots on hind margin of wing. Legs uniformly yellow; hind tibial fringe well developed, yellow.

**Male.**—Eye bare, distinctly differentiated into areas of large and small facets, the upper surface somewhat flattened. Coloration of body as in female.



*Type*.—Female, collection unknown, originally in the collection of M. Percheron.

*Type locality*.—United States.

*Distribution*.—Atlantic Coast States from New Jersey to Florida; Louisiana, Arkansas, and Arizona. March 12 (Paradise Key, Fla.) to August 31 (Mimsville, Ga.). In the United States National Museum, 120 females, 23 males.

Knab (6) pointed out that the Nearctic form, commonly determined as *Tabanus mexicanus* Linnaeus, differs from the true *mexicanus* and other Neotropical species, and to it he applied the name *T. flavus* Macquart. Since this name is preoccupied, Bequaert renamed the species *crepuscularis*.

### The Genus ANACIMAS Enderlein

*Anacimas* Enderlein, Deut. Ent. Ztschr. 1923: 545; Mitt. Zool. Mus. Berlin 11: 376, 1925. (Genotype, *Anacimas limbellatus* Enderlein.)

*Generic characters*.—Small to medium sized, rather stout species; eye pilose to nearly bare; in male the large and small facets probably sharply differentiated (male of genotype unknown); frons of female rather broad; no ocellar tubercle; third antennal segment with five divisions, the first with a distinct but obtuse dorsal angle; rather long, scattered hair on both basal and annulate portions of third segment; palpus short and stout, with erect hair; in female the proboscis no longer than palpus; wing venation normal.

#### Key to the Nearctic Species of *Anacimas*

1. Wing veins not margined with brown; median callus of female narrow and not strongly convex; a pair of narrow, sublateral, gray stripes on mesoscutum and a broader pair on abdomen above; (central part of the United States)-----*dodgei* (Whitney), p. 28.

Wing veins margined with brown; median callus of female rather broad and decidedly convex; mesoscutum without gray stripes and those on abdomen more yellowish brown; (southeastern part of the United States)-----

2. Length 13 mm; basal portion of third antennal segment strongly convex below, the dorsal angle near middle of length

*limbellatus* Enderlein, p. 29.

Length 16 mm; basal portion of third antennal segment more elongate, scarcely convex below, the dorsal angle basad of middle

*geropogon* Philip, p. 30.

#### ANACIMAS DODGEI (Whitney), new combination

(Fig. 9, B)

*Tabanus dodgei* Whitney, Canad. Ent. 11: 37-38, 1879; Hine, Ohio. Nat. 5: 236, 1904; Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8: 86, 1933.

Stout, medium sized; brown and gray, the gray forming conspicuous but narrow stripes on thorax and two broader stripes on abdomen.

*Female*. Length 13-15 mm. Eye pilose, purple, with two green stripes, the upper stripe wider than the lower and wider than the space between. Frons about two and one-half times as high as width at base, with sides parallel or slightly divergent above, yellowish gray, with black hair; basal callus transverse, dark brown, often rather irregular; a narrow median callus above, usually narrowly joined to basal callus; vertex somewhat swollen, sometimes partially denuded, shiny dark brown, but with a median depressed line and no ocellar tubercle; subcallus yellowish gray. Clypeus and genae nearly white, with long white hair. First two antennal segments yellow, with black hair above; third dark brown to black, except for extreme base, which is yellow; basal portion slender, rounded above; annulate portion about equal in length to basal portion. Second palpal segment short, stout, pale cream colored, with a mixture

of erect white and black hairs, the latter few in number. Proboscis brown, short.

Mesonotum dull brown, the mesoscutum with a very narrow, pale, median line divided by a dark line, a pair of bluish-gray sublateral stripes, and some gray laterally; prescutal lobe reddish gray, with black hair. Pleura, sternum, and coxae gray, with white hair. Wing hyaline, the costal cell and stigma yellowish, veins dark brown. Legs yellowish, the bases of femora and apices of tarsi somewhat infuscated; hind tibial fringe black, the hairs long and sparse.

Abdomen brown, with a pair of sublateral light-gray stripes, each about as wide as median brown stripe; posterior margins of tergites with a fringe of short whitish hair; venter nearly uniformly yellowish brown, with concolorous hair.

*Male*.—Eye densely pilose, the areas of large and small facets clearly differentiated, the small facets extending around outer margin to vertex in a narrow band, but the lower, outer corners of area of large facets rectangular. Frontal triangle gray, not protuberant. First two antennal segments and second palpal segment cream colored, with long black and white hair. Coloration of body essentially as in female, the sublateral pale stripes on abdomen faintly tinged with orange.

Described from a specimen collected in April in Riley County, Kans.

*Cotypes*.—Nine females, now lost.

*Type locality*.—Glencoe, Nebr.

*Distribution*.—Nebraska, Kansas, Oklahoma. April 21 (Ardmore, Okla.), to May 28 (Onaga, Kans.). In the United States National Museum, eight females, one male.

#### ANACIMAS LIMBELLATUS Enderlein

(Fig. 10, A)

*Anacimas limbellatus* Enderlein, Deut. Ent. Ztschr. 1923: 545; Mitt. Zool. Mus. Berlin 11: 376, 1925.

Rather small; brownish, with an indistinct, dark, median stripe on abdomen; basal portion of third antennal segment distinctly convex below, dorsal angle about at mid-length.

*Female*.—Length 13 mm. Eye with sparse, short pile. Frons yellowish brown, parallel-sided, two and one-half times as high as wide; basal callus shiny, orange brown, touching eyes, rounded above and slightly wider than



FIGURE 10.—Antenna, front view of head, and palpus of (A) *Anacimas limbellatus* and (B) *A. geropogon*.

high; median callus shiny, nearly black, circular, strongly protuberant, about two-thirds width of frons and connected to basal callus by a narrow denuded line; vertex with no denuded area but with a median depression; subcallus moderately convex, yellowish brown, the median groove pronounced. Antenna yellow, the first two segments with long black hair, third with scattered black hair on dorsal angle and on annulate portion; first segment about as broad as long, not swollen dorsally; second with blunt dorsal angle; basal portion of third distinctly convex below, with a rounded angle above at about middle and no excision, its greatest width about three-fourths its length; annulate portion slightly shorter than basal portion, with four indistinct annuli. Clypeus and genae gray, with white hair. Palpus pale yellowish, the first segment globose, with long white hair, second short and stout, tapering to a blunt apex, with long, erect, black hair. Proboscis very short.

Dorsum of thorax brownish black, with fine, erect, yellowish hair, the mesoscutum with three slender lines of grayish pollen; prescutal lobe yellowish, with black hair. Pleura, sternum, and coxae gray tinged with yellowish brown. Wing hyaline, the costal cell and margins of all veins yellowish brown; venation normal. Legs yellow, with black hair, the tarsi slightly darker.

Abdomen yellowish brown, with a darker median stripe on dorsum and a mixture of black and yellowish hair.

*Male*.—Unknown.

*Type*.—Female, in the Berlin Museum.

*Type locality*.—United States, probably St. Johns Bluff, St. Johns River, Fla.

*Distribution*.—Duval (?) and Volusia Counties, Fla. August 4 (Volusia County). In the United States National Museum, one female.

The above description and the drawings were made from the type, an old and, presumably, somewhat faded specimen. The specimen from Volusia County, in the United States National Museum, differs from the type in being somewhat darker and grayer with a black frontal callus, with a slightly more elongate median callus, and with a little longer process on the second antennal segment. The specimen was preserved in alcohol and is not in the best of condition, but there seems to be no doubt about its identity. Without doubt fresher specimens would be darker than the type.

#### ANACIMAS GEROPOGON Philip

(Fig. 10, B)

*Anacimas geropogon* Philip, Ent. News 47: 229-231, 1936.

Stout, medium sized; brown, with a dark-brown median stripe on abdomen; wing veins margined with brown; third antennal segment scarcely convex below, the rounded dorsal angle before middle.

*Female*.—Length 16 mm. Eye with very sparse, short pile, green blue, with three slender purple bands close together. Frons scarcely more than three times as high as wide, with nearly parallel sides, yellowish brown, with some denuded spots at the somewhat swollen vertex, but with no ocellar tubercle; basal callus shiny black, convex, slightly wider than high and touching eyes; median callus shiny black, rather convex, bluntly ellipsoid and narrowly separated from basal callus; subcallus yellowish brown, rather flat. Antenna uniformly orange; first two segments with long black hair; basal portion of third with nearly straight ventral margin and with a blunt dorsal angle slightly before middle, and a shallow excision; annulate portion slightly shorter than basal portion; a few long black hairs at dorsal angle and shorter, scattered, black hairs on annulate portion. Clypeus and genae pale gray, with long white hair. Palpus cream colored, with long white hair; second segment very stout, with long, erect, black hair in addition. Proboscis scarcely longer than palpus, the labellae very small.

Mesonotum brown, with an indication of two paler dorsal stripes and a gray margin from above wing base to apex of scutellum. Pleura, sternum, and coxae gray, with long white hair. Wing nearly hyaline except brown costal cell and margins of all veins; venation normal. Legs almost uniformly yellowish orange, with mostly black hair; hind tibial fringe not well developed.

Abdomen broad, yellowish brown above, with a broad, dark, median stripe and a brownish stripe along each edge; venter nearly uniformly pale brown, with pale hair.

*Male*.—Eye sparsely pilose, the areas of large and small facets sharply differentiated. Second palpal segment short and stout, with long black hair. Color essentially as in female although the brown abdominal stripes are evanescent.

*Type*.—Female, in the collection of C. B. Philip. Allotype male in the Ohio State Museum; paratypes, two males in the Ohio State Museum and in the United States National Museum (No. 51959).



*Type locality*.—Carolina Beach, N. C. (Published as "California Beach").

*Distribution*.—North Carolina, April 7 (Southern Pines) to April 20 (Carolina Beach).

### The Genus STENOTABANUS Lutz

*Stenotabanus* Lutz, Brazil-Medico 27 (45): 487, 1913; Mem. Inst. Oswaldo Cruz 6: 167, 1914; Enderlein, Mitt. Mus. Zool. Berlin 11: 354-355, 1925; Kröber, Enc. Ent. Dipt. 5: 113-114, 1929. (Genotype, *Tabanus tueniotus* Wiedemann.)  
*Styposelaga* Enderlein, Mitt. Mus. Zool. Berlin 10: 348, 1922; 11: 342-343, 1925. (Genotype, *Styposelaga sexannulata* Enderlein.)

*Generic characters*.—Rather small, slender; third antennal segment with scarcely any dorsal angle and no excision; eye bare or sparsely pilose; a small ocellar tubercle or denuded spot at vertex present or absent; first antennal segment not swollen; base of vein  $R_4$  usually with a rather long stump vein.

Considering the Nearctic species alone, it would appear that *psammophilus* (Osten Sacken) and related forms should be considered at least subgenerically distinct from the more typical *flavidus* (Hine). The Neotropical species, however, *longipennis* Kröber and *quinquestriatus* Kröber, form connecting links that would seem to prohibit separation of the genus into clearly defined groups. Most of our species have taken to an ocean beach or desert environment, with a consequent graying or whitening of color.

### Key to Nearctic Species of *Stenotabanus*

1. Frons of female more than four and one-half times as high as width at basal callus; brown species with one or three rows of pale spots on abdomen----- 2  
     Frons of female four or less times as high as width at basal callus; grayish species----- 3
2. A distinct ocellar tubercle; abdomen with a single median row of gray triangles----- *flavidus* (Hine), p. 31.  
     No ocellar tubercle; abdomen with three rows of faint brownish spots ----- *daedalus*, new species, p. 32.
3. Almost uniformly whitish species, the abdomen not marked with brown or dark gray----- 4  
     Abdomen brown or gray, with pale spots or stripes, or gray, with distinct brown spots----- 5
4. Frons of female less than twice as high as basal width; a short median callus present----- *magnicallus* (Stone), p. 33.  
     Frons of female over twice as high as basal width; no median callus present----- *psammophilus* (O. S.), p. 34.
5. Frons of female distinctly widened below; abdomen with three rows of gray spots; (Florida)----- *floridensis* (Hine), p. 34.  
     Frons of female parallel sided or narrowed below; abdomen otherwise; (western part of the United States)----- 6
6. Abdomen with a median gray stripe and sublateral spots ----- *productus* (Hine), p. 35.  
     Abdomen light gray, with tergites 2-4 each with four brown spots ----- *cribellum* (O. S.), p. 36.

### STENOTABANUS FLAVIDUS (Hine), new combination

(Fig. 11, A)

*Tabanus flavidus* Hine, Ohio Nat. 5: 236-237, 1904.

Rather small; yellowish brown, with a conspicuous row of pale-yellowish-brown median triangles on abdomen; ocellar tubercle distinct; vein  $R_4$  with an elongate stump.

*Female*.—Length 11-14 mm. Eye bare or with very indistinct short pile, bluish green, with three diagonal purple bands. Frons gray, about five and

one-half times as high as width at base, somewhat widened above; vertex with a distinct ocellar tubercle surrounded by a shiny-brown area; basal callus slightly higher than wide, dark orange brown; median callus slender, elongate; subcallus yellowish gray. Antenna with first two segments yellowish brown, with black hair; basal portion of third orange, with a distinct, but obtuse, dorsal angle and no excision; annulate portion black, about as long as basal portion. Clypeus and genae pale gray, with white hair. Second palpal segment pale yellow, with black hair, moderately stout at base, tapering to a blunt apex.

Thorax above brownish, with faint gray stripes and a mixture of orange, black, and white hair; prescutal lobe orange brown, with black hair. Pleura, sternum, and coxae pale gray, with white hair. Wing hyaline, rather noticeably elongate; a stump from vein  $R_4$  running parallel to vein  $R_{4+5}$ . Legs orange brown, the tarsi darker and fore tibia with basal half white haired, apical half black haired; hind tibial fringe sparse, white.



FIGURE 11.—Antenna, front view of head, and palpus of (A) *Stenotabanus flavidus* and (B) *S. daedalus*.

Abdomen above orange brown, darker apically, a median row of pale-yellowish-brown triangles arising from narrow posterior bands of same color which widen laterally; dark portions with dark, light portions with light, hair; venter orange brown, with white hair.

*Male*.—Unknown.

*Cotypes*.—In the collection of Ohio State University. Two specimens in the United States National Museum are probably of the cotype series.

*Cotype localities*.—Arizona and Sierra Madre, Chihuahua, Mexico.

*Distribution*.—Arizona to Chihuahua. July 8 (Huachuca Mountains, Ariz.) to July 14 (Sierra Madre, Chihuahua). In the United States National Museum, three females.

#### STENOTABANUS DAEDALUS, new species

(Fig. 11, B)

Small; dull yellowish brown; third antennal segment with stout basal portion and no dorsal excision, annulate portion with only three indistinct annuli; basal callus small and not touching eyes; frons rather narrow.

*Female*.—Length 9 mm. Eye sparsely pilose, green, with three purple bands. Frons four and three-fourths times as high as wide at base, slightly widened above, yellowish brown; basal callus yellowish brown, shiny, rounded, narrowly separated from subcallus and eyes; median callus a blackish spot reaching about halfway to vertex and narrowly joined to basal callus; subcallus pale yellowish brown. Antenna light yellowish brown, the annuli slightly darker; first two segments with black hair; basal portion of third with a blunt dorsal angle and no excision, about two-thirds as wide as long; annulate portion indistinctly three-segmented, about as long as width of basal portion; a few black hairs near dorsal angle and on annulate portion. Clypeus and genae white, with white hair. Palpus white, the second segment moderately stout at base, tapering to rather pointed apex; hair of first segment white, of second mixed black and white. Proboscis slightly longer than palpus.

Mesonotum blackish, with yellowish-brown lines in the usual pattern; prescutal lobe yellowish brown. Pleura, sternum, and coxae gray, with white hair. Wing hyaline, the costal cell tinged with yellow; venation normal.

Abdomen brown above, with an indication of three rows of yellowish-gray spots; venter uniformly yellowish gray.

*Male*.—Unknown.

*Type*.—Female, in the American Museum of Natural History.

*Type locality*.—Gainesville, Fla.

The type was collected some time between September 26 and October 2, 1914.

**STENOTABANUS MAGNICALLUS (Stone), new combination**

(Fig. 12, A)

? *Tabanus nanus* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 1, pp. 42-43, 1846. (Preoccupied by *Tabanus nanus* Wiedemann.)

*Tabanus maritimus* Townsend, Ent. News 9: 167, 1898. (Preoccupied by *Tabanus maritimus* Scopoli.)

*Tabanus magnicallus* Stone, Ent. Soc. Wash. Proc. 37: 19, 1935.

Small; gray, with nearly uniformly creamy-white abdomen; frons very broad; strong stump vein at base of vein R<sub>4</sub>.

*Female*.—Length 11 mm. Eye bare. Frons very broad, its height about one and one-third times width at base, slightly widened above, cream colored, with white hair; basal callus shiny black, nearly twice as broad as high, not quite touching eyes, very strongly swollen on each side of middle, and overhanging subcallus, the dorsal margin slightly concave; the median callus a short, black, median line above, slightly widened at top; vertex raised, the lower margin of raised portion a well defined, convex curve; extending straight across this raised portion a shiny-brown band touching eyes; subcallus broad, cream colored. First two antennal segments creamy white, with pale and some black hair; first

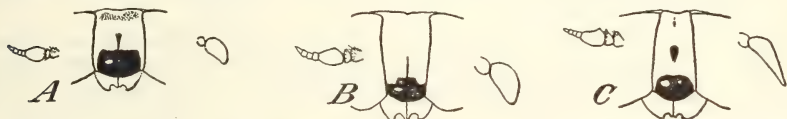


FIGURE 12.—Antenna, front view of head, and palpus of (A) *Stenotabanus magnicallus*, (B) *S. psammophilus*, and (C) *S. floridensis*.

segment about as broad as long, second about half length of first, without a dorsal process; third with basal portion brown, yellowish at extreme base, the upper margin only slightly swollen, and a few black hairs at summit; width at base about two-thirds of length; annulate portion slightly longer than basal portion, stout, black, with a few black hairs. Clypeus and genae white, with white hair. Palpus cream colored, with white hair, the second segment very short and swollen, nearly as wide as long. Proboscis stout, only a little longer than palpus.

Thorax yellowish brown, with short white hair, slightly grayer below. Wing hyaline, without spots, the veins dark brown except those of costal region, which are yellow; base of vein R<sub>4</sub> rectangular, with a strong stump; vein Cu<sub>1</sub> not reaching wing margin (in the two specimens examined). Legs yellowish, grayer basally, with pale hair except for some black hair on tarsi.

Abdomen rather elongate, nearly uniformly cream colored, the incisures slightly paler.

*Male*.—According to Townsend the difference between the large and small facets of the eye is not marked, but gradual and slight, the large facets confined to the inner central portion of the eye. A specimen in poor condition, from Galveston Island, Tex., appears to be this species but the large and small facets are distinctly differentiated and the area of large ones extensive. The whole body is densely clothed with short, white pubescence.

*Cotypes*.—Three males, collection unknown.

*Type locality*.—Padre Island, Tex.

*Distribution*.—Gulf coast of Texas from Galveston south. May (Galveston) to August 8 (Brazoria County). In the United States National Museum, one female.



**STENOTABANUS PSAMMOPHILUS (Osten Sacken), new combination**

(Fig. 12, B)

*Tabanus psammophilus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 445, 1876; Schwarz, Ent. Soc. Wash. Proc. 18: 210, 1916.

Small; white; antenna nearly uniformly yellowish brown; scarcely any infuscation at furcation; frons broad; a stump vein from vein  $R_4$ .

*Female*.—Length 10–13 mm. Eye bare, bluish, with three green bands, the median one very narrow. Whole body white, with white hair. Frons about two and one-half times as high as width at base, somewhat widened above; basal callus transverse, black; occasionally a short, indistinct, median line above, but no median callus; subcallus flat. Antenna pale yellowish brown, the annulate portion of third segment darker; third segment with a low, rounded, dorsal swelling and no excision; annulate portion equal in length to basal portion, stout, the divisions distinct. Second palpal segment white, with white hair.

Mesoscutum with faint indications of stripes. Wing hyaline, veins pale basally and anteriorly, darker apically, the stigma yellowish; cross veins and furcation sometimes narrowly margined with dark brown; a strong stump at base of vein  $R_4$ ; cell  $R_5$  not narrowed apically. Legs somewhat yellowish; hair of hind tibia entirely white.

In poorly preserved specimens from which some of the pollen has been abraded, the body has a reddish tint, and the pale hind margins of the abdominal segments are more conspicuous than is normal.

*Male*.—Eye rounded above, the area of large facets extensive and sharply differentiated from area of small ones, which is confined to lower margin. Antenna entirely yellowish.

*Type*.—The female specimen of a pair in the Museum of Comparative Zoology, No. 4040, herein designated as lectotype. Two males in the United States National Museum are probably of the cotype series.

*Type locality*.—Fort Capron, Fla.

*Distribution*.—Southern Florida. February (Miami) to June 18 (Cocoanut Grove, Dade County). In the United States National Museum, 4 females, 12 males.

The writer refers to the genus *Stenotabanus* the West Indian species *Tabanus atlanticus* Johnson and *T. nervosus* Curran. Both are closely related to *psammophilus*. The former differs in having the annulate portion of the antenna black and some black hair on the palpus; the latter, in its much more coarsely spotted wing and its basally darkened third antennal segment.

**STENOTABANUS FLORIDENSIS (Hine), new combination**

(Fig. 12, C)

*Tabanus floridensis* Hine, Ohio Nat. 12: 513, 1912.

Small; gray, with three rows of gray spots on abdomen; frons broad, narrowed above.

*Female*.—Length 10–12 mm. Eye bare. Frons slightly over twice as high as width across basal callus, somewhat narrowed above; frons and subcallus brownish gray; basal callus black, transverse, protuberant; median callus small, separated from basal callus or connected by a narrow line. First, second, and extreme base of third antennal segments orange brown, the third darker apically, the annulate portion black; basal portion of third segment rounded above, with no distinct angle; annulate portion slightly shorter than basal portion. Clypeus and genae gray, with grayish-white hair. Second palpal segment slightly swollen basally, with slender apex, yellowish gray, with a mixture of black and white hair.

Thorax black above, gray except for extreme sides, which are yellowish brown, and an indication of yellowish-brown lines in usual pattern; rest of thorax and coxae gray, with whitish hair. Wing hyaline, with dark-brown

veins; venation normal, or vein  $R_4$  with a short stump. Legs dusky orange brown, the tarsi somewhat darker; hind tibial fringe of fine black hair.

Abdomen above dark brown, with black hair, the hind margins of tergites, a median row of narrow triangles, rather large sublateral spots joined to hind margins, and extreme lateral margins gray tinged with yellowish, and with white hair; venter gray, with white hair.

*Male*.—Unknown.

*Type*.—Female, in collection of Ohio State University.

*Type locality*.—Fort Meade, Fla.

*Distribution*.—Florida. January 19 (Lake Worth) to April 18 (Inverness). In the United States National Museum, seven females.

**STENOTABANUS PRODUCTUS (Hine), new combination**

(Fig. 13, A)

*Tabanus productus* Hine, Ohio Nat. 5:242, 1904; Rowe and Knowlton, Canad. Ent. 67:243, 1935.

Small; grayish, with a faint, median, lighter-gray stripe on abdomen; head broad, with frons considerably widened above; vein  $R_4$  with long stump reaching toward  $R_{2+3}$ .

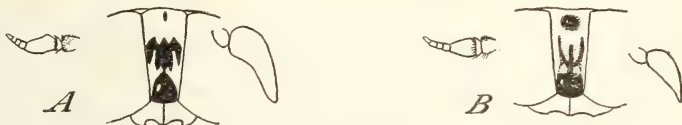


FIGURE 13.—Antenna, front view of head, and palpus of (A) *Stenotabanus productus* and (B) *S. cribellum*.

*Female*.—Length 10–13 mm. Eye bare or very sparsely pilose, the head rather broad; inner, lower angle of eye unusually acute. Frons gray, three and one-half to four times as high as width across basal callus, distinctly widened above; basal callus shiny black, square or slightly broader than high; median callus large, transverse, irregular, touching eyes, rarely narrowly joined to basal callus; vertex usually with a small to rather large shiny-brown to black spot but no tubercle; subcallus gray, faintly tinged with yellow. Antenna black, the third segment sometimes tinged with brown, slender, with a slight dorsal angle and scarcely any dorsal excision; annulate portion shorter than basal portion. Clypeus and genae white, with white hair. Second palpal segment cream colored, with a mixture of short white and black hairs, stout, tapering to a rather blunt apex.

Mesonotum black, with distinct lines of gray pollen in usual pattern; prescutal lobe reddish. Pleura, sternum, and coxae gray, with mostly white hair. Wing hyaline; base of vein  $R_4$  with a long stump reaching toward  $R_{2+3}$ , its direction being parallel with vein  $R_5$ ; cell  $R_5$  distinctly narrowed apically. Legs black, the fore and middle tibiae white basally; fore tibia somewhat swollen; hind tibial fringe sparse, black and white.

Abdomen blackish above, with a uniform, median, gray stripe from base to apex and a sublateral row of rather indistinct spots, the spot on second tergite large and rather distinct; venter uniformly gray.

*Male*.—Eye with short, sparse pile, the areas of large and small facets sharply differentiated and the latter extending around margin of eye to vertex; second palpal segment stout, with acute apex. Coloration essentially as in female.

*Cotypes*.—Of both sexes, in the collection of Ohio State University. A female in the United States National Museum is probably from the cotype series.

*Type locality*.—Near Lander, Wyo., 5,000–7,000 feet.

*Distribution*.—From Oregon and California east to Wyoming and New Mexico. May 28 (Blue Creek, Utah) to September 11 (Timpie, Utah). In the United States National Museum, 22 females, 2 males.

## STENOTABANUS CRIBELLUM (Osten Sacken), new combination

(Fig. 13, B)

*Tabanus cribellum* Osten Sacken, Biologia Centrali-Americana, Insecta, Diptera, v. 1, pp. 52-53, pl. 1, fig. 10, 1886; Hine, Ohio Nat. 5: 236, 1904; Rowe and Knowlton, Canad. Ent. 67: 241, 1935.

*Diachlorus guttatus* Townsend, Kans. Acad. Sci. Trans. 13: 134-135, 1893.

*Tabanus guttatus* Townsend, Psyche 8: 147, 1897.

Small; grayish; abdominal tergites 2-4 each with four round, brown spots.

*Female*.—Length 11-12 mm. Eye bare or with very indistinct, short pile, green, with three purple bands. Frons gray, tinged with brown, three times as high as width at base, slightly widened above; basal callus shiny black, square or slightly broader than high, distinctly convex, with a depression above on each side of middle; median callus oblong, dull black, usually joined to basal callus but not reaching vertex; often similarly colored spots on each side of median callus and joined to it to form a trident-shaped, denuded area; vertex without tubercle but with a round shiny-black spot which does not touch eyes; subcallus yellowish gray. First antennal segment pale orange brown, with black hair above; basal portion of third dull brown, with a short, rounded, dorsal angle and no dorsal excision; annulate portion nearly black, stout, slightly longer than basal portion. Clypeus and genae nearly white, with concolorous hair. Second palpal segment rather short and stout, creamy white, with white and a few black hairs. Proboscis short, black.

Mesonotum blackish brown, the mesoscutum with five slender grayish-brown lines; humeral and prescutal lobes reddish brown. Pleura, sternum, and coxae gray, with white hair. Wing hyaline, the base of vein R<sub>4</sub> with a stump running forward in a direction parallel with vein R<sub>5</sub>. Femora gray, fore pair tinged with reddish; tibiae yellowish gray, the fore tibia slightly darker at apex; tarsi dark, but first segment of middle and of hind tarsus largely yellow; hair of femora and tibiae white.

First tergite with sides anteriorly gray, followed by a narrow transverse line of brown and a narrow posterior margin of yellowish gray; second tergite yellowish gray, with a narrow, anterior, brown band and a transverse row of four round, brown spots; anterior band tapering laterally and with a posterior median notch; median spots sometimes narrowly joined to anterior band; remaining tergites each with an anterior transverse band and four brown spots, the bands diminishing posteriorly; venter gray, the last segment or two often brownish.

*Male*.—Unknown.

*Cotypes*.—Three females, collection unknown.

*Type locality*.—Presidio, Mexico.

*Distribution*.—Utah to central Mexico. June 26-29 (Las Cruces, N. Mex.). In the United States National Museum, three females.

## The Genus TABANUS Linnaeus

*Tabanus* Linnaeus, Systema Naturae, ed. 10, v. 1, p. 601, 1758. (Genotype, *Tabanus bovinus* Linnaeus.)

*Neotabanus* Lutz, Inst. Oswaldo Cruz em Manguinhos, p. 29, 1909. (Genotype, *Tabanus trilineatus* Latreille.)

*Poecilosoma* Lutz, Inst. Oswaldo Cruz em Manguinhos, p. 29, 1909. (Preoccupied by *Poecilosoma* Hübner.)

*Poeciloderas* Lutz, Bol. Inst. Oswaldo Cruz 1: 15, 1921. (Genotype, *Tabanus quadripunctatus* Fabricius.)

*Dasyommia* Enderlein, Mitt. Zool. Mus. Berlin 10: 346, 1922. (Genotype, *Tabanus cinctus* Fabricius.)

*Dasyphyrtia* Enderlein, Mitt. Zool. Mus. Berlin 10: 344, 1922. (Genotype, *Tabanus maculipennis* Macquart.)

*Hybopelma* Enderlein, Mitt. Zool. Mus. Berlin 10: 351, 1922. (Genotype, *Tabanus quadripunctatus* Fabricius.)

*Hybomitra* Enderlein, Mitt. Zool. Mus. Berlin 10: 347, 1922. (Genotype, *Hybomitra solox* Enderlein.)

*Straba* Enderlein, Deut. Ent. Ztschr. 1923: 545. (Genotype, *Tabanus sudeticus* Zeller.)



*Sziladynus* Enderlein, Zool. Anz. 62: 181, 1925. (Genotype, *Tabanus aterrimus* Meigen.)  
*Poecilochlamys* Lutz, Estudios de zoologia y parasitologia venezolanos, p. 57, 1928. (Genotype, *Tabanus quadripunctatus* Fabricius.)  
*Taeniotabanus* Kröber, Diptera of Patagonia and South Chile, pt. 5, p. 140, 1930 (nomen nudum); Zool. Anz. 94: 69, 1931; Rev. Ent. 2: 201, 1932. (Genotype, *Tabanus occidentalis* Linnaeus.)  
*Therioplectes* authors (not Zeller).

*Generic characters*.—Eye bare or pilose; vertex smooth or with an ocellar tubercle, but no true ocelli; basal callus well developed, nearly or quite as wide as frons; frons never narrowed above; subcallus rarely greatly swollen, and if so, the eye hairy; antenna usually with a well developed dorsal angle but usually without a strong forward-projecting process; if process is present the eye is bare; stump vein from vein  $R_4$  usually absent and rarely long; cell  $R_5$  usually open and never with a long petiole from wing margin; tibiae not distinctly swollen.

Numerous attempts have been made to divide the genus *Tabanus*, with only partial success. It is obvious that such division would be highly desirable, if it could be accomplished, since the genus, as commonly recognized, contains species of considerable diversity. However, relatively few of the suggested lines of cleavage prove satisfactory, and the writer has been unable to find characters that will serve to support new divisions.

In the above synonymy the writer has listed only those proposed genera that appear to occur in the fauna under discussion. *Neotabanus* Lutz corresponds to our *lineola* group and is based on the presence of a parallel-sided, middorsal stripe on the abdomen. Kröber (11) retained it with subgeneric rank, although, as far as the writer sees, no structural characters distinguish it, and it contains species with both bare and pilose eyes. *Taeniotabanus* Kröber is congeneric with *Neotabanus*. *Poeciloderas* Lutz is represented in our fauna by *T. reinwardtii* and related species. It has been retained as a subgenus by Kröber (11) with some justification; certain species of the Southwestern States, having pilose eyes but no ocellar tubercle, seem to bridge the gap between the true *Tabanus* and *Sziladynus* (*Therioplectes* of authors). *Dasyommia* Enderlein has pilose eyes in the male, bare eyes in the female, and a very pronounced ocellar tubercle. The writer does not consider its genotype, *Tabanus cinctus*, generically distinct from the many pilose-eyed northern species with an ocellar tubercle. The genotype of *Dasyphyrtia* Enderlein is said by Kröber (11) to be possibly the same as *Tabanus quadripunctatus* var. *amabilis* Walker, and, therefore, congeneric with *Poeciloderas* Lutz. *Hybopelma* Enderlein and *Poecilochlamys* Lutz have the same genotype as has *Poeciloderas* Lutz. The writer studied the type of *Hybomitra solox* Enderlein and found it to be a typical *T. rhombicus* Osten Sacken. *Straba* Enderlein is based upon the presence of uniformly small facets in the eye of the male, in contradistinction to the differentiation found in the male of *T. bovinus*. Since this character is confined to the male sex and separates species that are very similar in all other respects, its value is very doubtful. *Sziladynus* Enderlein is congeneric with our pilose-eyed species with a distinct ocellar tubercle, such as *T. rhombicus* Osten Sacken and *T. laniferus* McDunnough, the latter more closely resembling the genotype than any other of our species. This is the subgenus *Therioplectes* of authors, not Zeller, the genotype of Zeller's genus being *T. tricolor*

Zeller, which differs in lacking an ocellar tubercle and in being more hairy throughout. The two chief characters of *Sziladynus*, possession of pilose eyes and an ocellar tubercle, unfortunately do not always occur together. *T. cinctus* and *T. carolinensis* lack pile on the eye in the female and yet have very distinct ocellar tubercles. Certain southwestern species such as *T. gilanus* and *T. intensivus* have pilose eyes but no ocellar tubercle and yet appear closely related to species such as *T. laticornis* in which the ocellar tubercle is well developed. Because of these anomalous species that fit into neither *Tabanus* restricted nor *Sziladynus*, and yet show no other characters to justify the erection of more genera, the writer has preferred to leave the further division of *Tabanus* until more satisfactory characters can be found.

*Key to Nearctic Females of Tabanus*

- |        |  |    |
|--------|--|----|
| 1.     | Eye pilose; second palpal segment very slender; no distinct ocellar tubercle; abdomen with a median stripe and rounded sub-lateral spots -----   | 2  |
|        | If eye is pilose and second palpal segment is very slender, a pronounced ocellar tubercle is present and abdomen is otherwise marked -----   | 4  |
| 2.     | Abdomen dark brown, with median line narrow and widening on each tergite at posterior margin -----   | 3  |
|        | Abdomen somewhat orange laterally, with a rather broad, nearly parallel-sided, median line ----- <i>bishoppi</i> Stone, p. 53.   |    |
| 3.     | Frons about two and one-half times as high as wide, the basal callus transverse; base of third antennal segment rather slender -----   |    |
|        | Frons about four times as high as wide, the basal callus higher than wide; base of third antennal segment rather stout -----   |    |
|        | <i>exilipalpis</i> , new species, p. 54.   |    |
| 4. (1) | Abdomen above with both median and sublateral pale spots; those of median row may be contiguous but do not form a parallel-sided stripe; no distinct ocellar tubercle present -----  | 5  |
|        | Abdomen otherwise marked or a distinct ocellar tubercle present -----  | 38 |
| 5.     | Furcation without a distinct brown spot -----  | 6  |
|        | Furcation with a distinct brown spot -----   | 33 |
| 6.     | Dorsum of thorax decidedly yellow in color, without longitudinal stripes; median abdominal triangles forming a conspicuous, continuous line regularly widening posteriorly on each tergite; frons narrow, widened above -----            | 7  |
|        | Without this combination of characters -----   | 8  |
| 7.     | Third antennal segment with annulate portion black; femora largely grayish -----   |    |
|        | Third antennal segment entirely orange; femora entirely yellowish -----  |    |
|        | <i>fulvulus</i> Wiedemann, p. 55.  |    |
|        | <i>fulvulus</i> variety <i>pallidescens</i> Philip, p. 56.   |    |
| 8. (6) | Median gray spot on tergite 2 lacking or much smaller than large ones on tergites 3 and 4 -----  |    |
|        | Median spots on tergites 3 and 4 not markedly larger than that on tergite 2 -----  | 9  |
| 9.     | Eye pilose -----   | 10 |
|        | Eye bare -----   | 15 |
| 10.    | Basal portion of third antennal segment about as wide as long, usually entirely orange, contrasting with black annulate portion; first antennal segment not greatly enlarged above; side of first tergite orange its entire length ----- |    |
|        | <i>laticornis</i> Hine, p. 57.   |    |
|        | Basal portion of third antennal segment obviously longer than wide; either first antennal segment greatly enlarged above or abdomen not broadly orange laterally -----   | 11 |
| 11.    | First antennal segment strongly swollen above -----  |    |
|        | <i>erythraeus</i> (Bigot), p. 58.  |    |
|        | First antennal segment not strongly swollen above -----  | 12 |

*Key to Nearctic Females of Tabanus*—Continued

12. Femora pale reddish-----*orbicallus* Philip, p. 59. 13  
 Femora dark-----
13. Hind tibial fringe white, with a few black hairs; third antennal segment rather elongate; light-gray abdominal spots usually rather large and whole body predominantly gray  
*intensivus* Townsend, p. 60. 14  
 Hind tibial fringe black, with few, if any, white hairs; third antennal segment shorter; pale abdominal spots not so large and whole body more black or brown-----
14. Venter medianly with abundant black hair  
*gilanus* Townsend, p. 61. 14  
 Venter with no black hair anterior to sternite 6  
*laticeps* Hine, p. 62.
15. (9) Antenna black, the first segment distinctly swollen above; usually a few black hairs on side of subcallus  
*fairchildi*, new species, p. 63. 16  
 Antenna black to yellow, the first segment not strongly swollen above; side of subcallus without hairs-----
16. Robust, dark brown to black, the sublateral, white, abdominal spots decidedly larger than the small triangles of median row-----*nivosus* Osten Sacken, p. 64. 17  
 Without this combination of characters-----
17. Grayish; 12 mm or more in length, with antenna orange except for black annulate portion; basal portion of third segment very stout; frons somewhat widened above; costal cell hyaline; (southwestern part of the United States)  
*euryceras* Philip, p. 65. 18  
 Not agreeing entirely with above-----
18. Length 12 mm or more, brownish, the frons usually not widened above; if less than 12 mm, the costal cell infuscated. 19  
 Smaller, dark species, the frons distinctly widened above; costal cell hyaline----- 30
19. Basal portion of third antennal segment black except at extreme base----- 20  
 Basal portion of third antennal segment mostly orange----- 22
20. Dorsal excision of third antennal segment deep; second palpal segment pinkish, strongly swollen basally, with acute apex; fore tibia conspicuously bicolored-----*pruinus* Bigot, p. 65. 21  
 Dorsal excision of third antennal segment very shallow; second palpal segment only slightly enlarged basally; fore tibia indistinctly bicolored-----
21. Vertex depressed, the surrounding area swollen; frons slightly more than four times as high as wide; last antennal annulus yellowish; triangle on tergite 3 narrowly reaching anterior margin-----*fulvicallus* Philip, p. 66. 21  
 Vertex not distinctly depressed; frons about three and one-half times as high as wide; last antennal annulus black; triangle on tergite 3 not quite reaching anterior margin  
*vivax* Osten Sacken, p. 67.
22. (19) All wing veins margined with brown; (southeastern part of the United States)-----*gracilis* Wiedemann, p. 68. 23  
 Longitudinal veins, at least, not margined with brown-----
23. Third antennal segment uniformly orange brown  
*zythicolor* Philip, p. 69. 24  
 Annulate portion of third antennal segment black-----
24. Basal portion of third antennal segment rather short and broad; either furcation faintly margined with brown or costal cell deeply infuscated----- 25  
 Basal portion of third antennal segment rather elongate; furcation not margined with brown and costal cell not deeply infuscated----- 27
25. A faint spot at furcation; costal cell hyaline  
*abactor* Philip, p. 69. 26  
 No spot at furcation; costal cell infuscated-----



Key to Nearctic Females of *Tabanus*—Continued

26. Frons about three times as high as width at base; coxae yellow  
*texanus* Hine, p. 70.  
 Frons more than three times as high as basal width; coxae  
 gray-----*longiusculus* Hine, p. 71.
27. (24) Frons narrow, distinctly widened above-----*sackeni* Fairchild, p. 72. 28  
 Frons moderate in width, with parallel sides-----
28. Second palpal segment distinctly swollen basally; median ab-  
 dominal spots forming a distinct stripe, regularly widening  
 on each tergite-----*sagax* Osten Sacken, p. 73. 29  
 Second palpal segment not greatly swollen; median abdominal  
 spots slender-----
29. Pale markings of abdomen yellowish brown, the sublateral spots  
 distinctly touching hind margins  
*sublongus*, new species, p. 74.  
 Pale markings of abdomen grayish, the sublateral spots small  
 and separated from hind margins-----*longus* Osten Sacken, p. 75.
30. (18) Eye, in life, with two or more purple bands; median callus sub-  
 quadrate; palpus not strongly swollen basally and not  
 sharply pointed----- 31  
 Eye unicolorous or with one purple band; median callus a  
 slender line; palpus strongly swollen basally, and with apex  
 acute----- 32
31. Third antennal segment broad, with a distinct angle above;  
 (eastern part of the United States)-----*pumilus* Macquart, p. 75.  
 Third antennal segment narrow, with scarcely any angle above;  
 (western part of the United States)-----*fratellus* Whitney, p. 76
32. (30) Eye unicolorous; (from New Jersey north)  
*sparus* Whitney, p. 77.  
 Eye with a single, diagonal, purple band; (from New Jersey  
 south)-----*sparus* subspecies *milleri* Whitney, p. 78.
33. (5) Wing with large brown maculations, these not confined to cross  
 veins and furcation; lateral abdominal spots confined to  
 posterior segments and often joined to median triangles  
*venustus* Osten Sacken, p. 78. 34  
 Wing not so colored and abdominal spots otherwise-----
34. Brown, elongate, the sublateral abdominal spots very faint; wing  
 suffused with brown-----*johnsoni* Hine, p. 79. 35  
 Black and white, the sublateral abdominal spots distinct; wing  
 not suffused with brown-----
35. Median and sublateral gray spots broadly confluent along poste-  
 rior margin----- 36  
 Median and sublateral gray spots scarcely, if at all, joined along  
 posterior margin----- 37
36. Frons broad, the basal callus subquadrate-----*birdiei* Whitney, p. 80.  
 Frons rather narrow, the basal callus distinctly higher than  
 wide-----*cymatophorus* Osten Sacken, p. 80.
37. (35) Not more than 14 mm in length; hind tibial fringe black  
*monoensis* Hine, p. 81.  
 Not less than 15 mm in length; hind tibial fringe white  
*reinwardtii* Wiedemann, p. 82.
38. (4) Eye bare; no ocellar tubercle present----- 39  
 Eye pilose, or, if bare, a distinct ocellar tubercle present----- 93
39. Either abdomen unicolorous or tergites with narrow posterior  
 pollinose bands----- 40  
 Neither abdomen unicolorous nor tergites with only narrow,  
 posterior bands----- 58
40. Palpus reddish brown to white, or, if dark reddish, the body  
 25 mm or more in length, with hyaline wing and dark costal  
 cell----- 41  
 Palpus dark brown to black----- 47
41. Furcation without a distinct brown spot; (costal cell colored or  
 hyaline)----- 42  
 Furcation with brown spot; (costal cell yellow)----- 44
42. Medium sized; costal cell hyaline-----*rufofrater* Walker, p. 101. 43  
 Large; costal cell yellow or brown-----

Key to Nearctic Females of *Tabanus*—Continued

43. Wing hyaline, the costal cell dark brown; (abdomen usually banded with gray)-----*americanus* Forster, p. 83.  
Wing uniformly dilute brown, the costal cell yellow-----*giganteus* Degeer, p. 84.
44. (41) Cell  $R_6$  not narrowed apically-----*turbidus* Wiedemann, p. 112.  
Cell  $R_6$  narrowed apically-----45
45. Legs nearly uniformly orange brown-----46  
Femora, at least, black-----*gladiator* Stone, p. 85.
46. Base of third antennal segment with a prominent, forward-projecting process-----*imitans* Walker, p. 86.  
Dorsal angle of third antennal segment not projecting forward-----*imitans* var. *excessus*, new variety, p. 87.
47. (40) Furcation without a distinct dark cloud, although whole wing may be infuscated or petiole of cell  $R_4$  may be margined with brown-----48  
Furcation with a distinct dark cloud-----53
48. Basal callus transverse-----49  
Basal callus square or higher than wide-----51
49. Mesoscutum with bright-orange hair laterally-----*atratus* var. *fulvopilosus* Johnson, p. 89.  
Mesoscutum entirely dark haired-----50
50. Wing uniformly dark brown to black-----*atratus* Fabricius, p. 87.  
Wing brown, with a distinct yellowish tinge along hind margin-----*atratus* var. *nantuckensis* Hine, p. 89.
51. (48) Frons more than six times as high as basal width, widened above; veins of basal portion of wing margined with brown-----*morbosus*, new species, p. 89.  
Frons less than four and one-half times as high as basal width, with parallel sides; wing either nearly hyaline or deeply infuscated-----52
52. Wing nearly hyaline-----*acrotus* Osten Sacken, p. 90.  
Wing deeply infuscated-----*wiedemanni* Osten Sacken, p. 91.
53. (47) Mesonotum dark brown to black-----54  
Mesonotum pale-----56
54. Frons narrow, distinctly widened above; antenna mostly orange-----*proximus* Walker, p. 91.  
Frons moderate in width, with nearly parallel sides; antenna mostly black-----55
55. Wing nearly hyaline distad of basal cross veins-----*nigrescens* Palisot, p. 92.  
Wing nearly black-----*nigrescens* var. *atripennis* Stone, p. 93.
56. (53) Fore tibia bicolored; (western)-----*punctifer* Osten Sacken, p. 93.  
Fore tibia uniformly dark-----57
57. Frons moderate in width, orange brown-----*styqins* Say, p. 94.  
Frons very broad, gray-----*subniger* Coquillett, p. 95.
58. (39) Abdomen orange brown, with a median dark area which expands posteriorly; (wing fumous or spotted with brown)-----59  
Abdomen with a single median row of pale spots or with a stripe, with or without lateral pale spots-----60
59. Median dark area of abdomen a row of dark, subquadrate spots; femora black-----*abdominalis* Fabricius, p. 116.  
Median dark area continuous; femora orange brown-----*fumipennis* Wiedemann, p. 96.
60. (58) Abdomen with a single median row of pale spots not forming a parallel-sided stripe; these sometimes arise from apical bands which widen toward lateral margins but do not form distinct sublateral spots or triangles-----61  
Abdomen with a parallel-sided stripe, with or without sublateral spots or stripes-----86
61. No spot on tergite 2; fore tibia distinctly bicolored; venter of abdomen with a distinct, median, brown stripe; furcation and cross veins faintly margined with brown-----*trimaculatus* Palisot, p. 96.  
A pale spot on tergite 2, sometimes very faint; and differing in, at least, one other character mentioned-----62

Key to Nearctic Females of *Tabanus*—Continued

62. Pale spot on tergite 2 distinctly smaller than those on tergites 3 and 4; scutellum with distinct pale pile; fore tibia nearly uniform in color----- 63  
 Not with above combination of characters----- 65
63. Abdominal triangles large and broad----- 64  
 Abdominal triangles small-----*superjumentarius* Whitney, p. 99
64. Frons less than five times as high as width at base, only moderately widened above; veins  $R_1$  and  $R_{2+3}$  not distinctly margined with brown; mid and hind tibiae pale reddish brown, the apices not markedly darker-----*molestus* Say, p. 97.  
 Frons more than six times as high as width at base, considerably wider above; veins  $R_1$  and  $R_{2+3}$  distinctly margined with brown; mid and hind tibiae creamy white, the extreme apices dark brown to black-----*moderator*, new species, p. 98.
65. (62) Furcation not margined with brown, or, if a faint spot is present, there is also a stump vein at furcation----- 66  
 Furcation distinctly margined with brown, stump vein rarely present----- 73
66. Rather small, compact, not over 15 mm long, dark reddish brown, the pale abdominal triangles arising from narrow bands; subcallus denuded or very thinly pollinose; fore tibia not markedly bicolored, although there may be pale hair basally  
*coffeatus* Macquart, p. 100.  
 Without this combination of characters----- 67
67. Fore tibia uniform in ground color----- 68  
 Fore tibia distinctly bicolored----- 70
68. Costal cell hyaline; (dusty reddish brown, the median abdominal triangles faint)-----*rufofrater* Walker, p. 101.  
 Costal cell distinctly colored----- 69
69. Third antennal segment with considerable black; abdominal triangles small but rather distinct, narrow, not arising from bands; cell  $R_5$  not narrowed toward margin  
*catenatus* Walker, p. 102.  
 Third antennal segment mostly red; abdominal triangles very faint, but arising from faint bands; cell  $R_5$  somewhat narrowed toward margin-----*giganteus* Degeer, p. 84.
70. (67) Abdominal triangles small and narrow on tergites 3 and 4; palpus reddish brown; (length over 18 mm)  
*actaeon* Osten Sacken, p. 103.  
 Abdominal triangles large and broad on tergites 3 and 4; palpus yellowish white----- 71
71. Vein  $R_4$  with stump; hind tibia nearly half black; furcation faintly margined with brown-----*lacustris* Stone, p. 104.  
 Without this combination of characters----- 72
72. Median triangle on tergite 2 slightly expanded anteriorly; cell  $R_5$  closed and petiolate; hind tibia uniformly yellowish, with black hair-----*petiolatus* Hine, p. 105.  
 Median triangle on tergite 2 not expanded anteriorly and often not reaching anterior margin; cell  $R_5$  usually narrowed or just closed; hind tibia with extreme apex usually blackened  
*melanocerus* Wiedemann, p. 106.
73. (65) Fore tibia unicolorous or rarely the base brownish, with orange black hair, the apex darker----- 74  
 Fore tibia distinctly bicolored, the basal portion light, with pale-yellowish hair----- 85
74. Venter of abdomen black, with strongly contrasting, rather broad bands; (tibia bright orange, with concolorous hair)  
*trijunctus* Walker, p. 107.  
 Venter of abdomen brownish, the pale bands, if present, not strongly contrasting, or, if venter is black, the bands very narrow----- 75



Key to Nearctic Females of *Tabanus*—Continued

75. Height of frons not more than four times basal width, with parallel sides; basal callus large, very shiny, and usually rectangular or square----- 76  
 Height of frons not less than four and one-half times basal width and usually somewhat widened above; basal callus not so large and usually narrowed above----- 81
76. Basal portion of third antennal segment with no dorsal excision  
*endymion* Osten Sacken, p. 108.----- 77  
 Basal portion of third antennal segment distinctly excised above.----- 77
77. Entirely orange brown, including wing, the median triangles faint and not arising from bands on hind margins of tergites  
*johnsoni* Hine, p. 79.----- 78  
 Otherwise colored----- 78
78. Abdomen orange brown, with yellowish bands on hind margins of tergites that expand into rather large median triangles  
*cheliopterus* Rondani, p. 109.----- 79  
 Abdomen uniformly dark reddish to nearly black, the small, median, white triangles not arising from bands----- 79
79. Abdominal white spots very small, as broad as long----- 80  
 Abdominal white spots larger, considerably longer than broad  
*recedens* Walker, p. 110.----- 80
80. Base of third antennal segment with a prominent, forward-projecting process----- *imitans* Walker, p. 86.  
 Dorsal angle of third antennal segment not projecting forward  
*imitans* var. *excessus*, new variety, p. 87.----- 82
81. (75) Cell  $R_5$  closed or strongly narrowed apically----- 82  
 Cell  $R_5$  wide open----- 83
82. Legs uniformly orange brown----- *nefarius* Hine, p. 111.  
 Femora black----- *giganteus* Degeer, p. 84.
83. (81) Annulate portion of third antennal segment shorter than basal portion, the latter scarcely excised above; usually less than 17 mm in length----- *coarctatus* Stone, p. 111.  
 Annulate portion of third antennal segment longer than basal portion, the latter with a rather pronounced dorsal excision; usually over 17 mm long----- 84
84. Costal cell yellow; frons about six times as high as basal width and conspicuously widened above; antenna entirely orange brown; hair of hind tibia predominantly brownish  
*turbidus* Wiedemann, p. 112.-----  
 Costal cell nearly hyaline; frons about four and one-half times as high as basal width and not so distinctly widened above; basal portion of third antennal segment with considerable black; hair of hind tibia mostly pale yellowish  
*equalis* Hine, p. 113.-----
85. (73) Frons moderate in width; pale abdominal triangles distinct; at least middle femur brownish; cell  $R_5$  narrowed toward margin but rarely closed; wing nearly hyaline but for spots----- *sulcifrons* Macquart, p. 114.  
 Frons very narrow, slightly widened above; pale abdominal triangles usually not so distinct as the larger black markings; all femora black; cell  $R_5$  closed; anterior half of wing distinctly yellowish brown----- *abdominalis* Fabricius, p. 116.
86. (60) Furcation with a small spot; (more than 15 mm long, yellowish brown)----- *acutus* (Bigot), p. 117.----- 87  
 Furcation without a spot----- 87
87. Eye with a single purple band; frons nearly parallel-sided; annulate portion of third antennal segment usually longer than basal portion; costal cell colored, sometimes faintly; prescutal lobe usually concolorous with rest of mesoscutum----- 88  
 Eye with two purple bands; frons somewhat widened above; annulate portion of third antennal segment shorter than basal portion; costal cell as hyaline as rest of wing; prescutal lobe usually paler than rest of mesoscutum----- 92

Key to Nearctic Females of *Tabanus*—Continued

88. Palpus, pleura, and costal cell deeply yellow  
*vicarius* Walker, p. 117.
89. Palpus white, pleura grayish, costal cell variable----- 89  
 Frons about two and one-half times as high as wide; a very small, slender species-----*cayensis* Fairchild, p. 119.  
 Frons three or more times as high as wide; larger and not so slender----- 90
90. Costal cell strongly infuscated; frontal callus brown  
*fuscicostatus* Hine, p. 119.
91. Costal cell not strongly yellow, or, if so, frontal callus black----- 91  
 Abdomen largely yellow brown laterally; costal cell usually weakly colored-----*nigrovittatus* Macquart, p. 120.  
 Abdomen black laterally, the lateral spots evanescent; costal cell usually strongly brownish yellow-----*mularis* Stone, p. 121.
92. (87) Scutellum entirely black; median callus a narrow, rather elongate line-----*lineola* Fabricius, p. 122.  
 Scutellum reddish at tip; median callus short and slightly broadened-----*lineola* var. *scutellaris* Walker, p. 123.
93. (38) Abdomen with a parallel-sided, median, pale stripe; no ocellar tubercle-----*truquii* Bellardi, p. 123.
94. Not with this combination of characters----- 94  
 Rather small, with shiny-black thorax, very slender, dark palpus, denuded subcallus, and a cloud on wing in region of stigma----- 95
95. With this combination of characters----- 96  
 Basal portion of third antennal segment orange; cloud on wing faint-----*hinei* Johnson, p. 124.  
 Basal portion of third antennal segment predominantly black; cloud on wing distinct and extensive  
*hinei* var. *wrighti* Whitney, p. 125.
96. (94) Black species with tergites 1-3 and sternites 1-4 mostly orange, the others entirely black-----*cinctus* Fabricius, p. 125.
97. Abdomen not so colored----- 97  
 Eye bare; abdomen not black, with a single median row of white triangles-----*carolinensis* Macquart, p. 126.  
 Eye pilose, if pile indistinct, abdomen with a single median row of white triangles----- 98
98. Entirely black, including palpus----- 99  
 Not entirely black----- 101
99. Subcallus denuded-----*procyon* Osten Sacken, p. 127.
100. Subcallus pollinose----- 100  
 Basal callus transverse, touching eyes; furcation and cross veins not margined with brown-----*laniferus* McDunnough, p. 151.  
 Basal callus higher than wide, not touching eyes; furcation and cross veins margined with brown-----*sequax* Williston, p. 128.
101. (98) Cross veins distinctly margined with brown, the spotting obvious; first tergite broadly orange laterally  
*lasiophthalmus* Macquart, p. 128.
102. Cross veins not margined with brown, although furcation may have a spot, or, if cross veins are noticeably margined with brown, first tergite not broadly orange laterally----- 102  
 Abdomen broadly orange brown laterally; the median black area usually constricted on tergite 3; sublateral pale spots not conspicuous----- 103  
 Abdomen not broadly orange laterally; if paler laterally, the median dark area is rather broad and not constricted on tergite 3; sublateral pale spots, if present, distinct and usually with little if any orange brown around them----- 116
103. Hind tibial fringe well developed, mostly orange or yellowish----- 104  
 Hind tibial fringe weak, or, if well developed, largely black----- 106
104. Length 18 mm or more; second palpal segment rather stout basally; (western)-----*californicus* Marten, p. 129.

Key to Nearctic Females of *Tabanus*—Continued

- Length 17 mm or less; second palpal segment slender to stout; (usually eastern)----- 105
105. Second palpal segment distinctly swollen basally; frons about five times as high as width at base  
*epistates* Osten Sacken, p. 136.  
 Second palpal segment slender throughout; frons about three and one-half times as high as width at base  
*aurilimbus*, new species, p. 130.
106. (103) Second palpal segment unusually slender----- 107  
 Second palpal segment not unusually slender----- 108
107. Median black stripe of abdomen narrow; dorsal angle of third antennal segment obtuse; orange on side of first tergite reaching to anterior margin; second sternite entirely orange  
*trepidus* McDunnough, p. 131.  
 Median black stripe of abdomen broad; dorsal angle of third antennal segment small, usually acute, the dorsal excision pronounced; first tergite usually darkened along entire anterior margin; second sternite usually blackened medially  
*gracilipalpis* Hine, p. 132.
108. (106) Antenna black, rarely with a little orange on second and base of third segments; third segment narrow, with obtuse dorsal angle and little if any dorsal excision; palpus strongly swollen basally; vein  $R_4$  often with a stump----- 109  
 Not with this combination of characters----- 111
109. Frons slightly less than three times as high as wide, the sides nearly parallel-----*philipi*, new species, p. 133.  
 Frons about four times as high as width at base, usually somewhat widened above----- 110
110. Venter of abdomen with mostly yellowish hair, although there may be some scattered black hairs medially  
*sonomensis* Osten Sacken, p. 133.  
 Venter of abdomen nearly uniformly clothed with fine black hair, the yellowish hair usually sparse except along incisures  
*sonomensis* var. *phaenops* Osten Sacken, p. 134.
111. (108) Subcallus pollinose----- 112  
 Subcallus denuded----- 115
112. Pale spots on median black area of abdomen forming a slender, usually continuous line; third antennal segment largely black; length 12–13 mm; (Atlantic Coast)  
*daeckei* Hine, p. 135.
- Not entirely as above----- 113
113. Frons about five times as high as width at base, somewhat widened above; antenna largely orange; 16 mm or less in length; palpus stout basally-----*epistates* Osten Sacken, p. 136.  
 Frons not over four times as high as width at base, and disagreeing in one or more of the other characters mentioned above----- 114
114. Dorsal excision of third antennal segment shallow; second palpal segment creamy white and somewhat swollen basally; frons broad and distinctly widened above  
*haemaphorus* McDunnough, p. 137.  
 Dorsal excision of third antennal segment rather pronounced; second palpal segment orange brown and scarcely swollen basally; frons neither so broad nor so widened above  
*affinis* Kirby, p. 137.
115. (111) Second palpal segment strongly swollen basally, pale cream colored; basal callus flat, wrinkled-----*nudus* McDunnough, p. 138.  
 Second palpal segment moderate in width at base, brownish; basal callus convex-----*captonis* Marten, p. 139.
116. (102) Abdomen with bands along posterior margins of tergites; little or no indication of median or sublateral spots----- 117  
 Abdomen entirely dark, or distinct median or sublateral pale spots, or both, present----- 120
117. Palpus short, stout, creamy white-----*oklahomensis* Stone, p. 140.  
 Palpus slender, reddish brown to black----- 118



*Key to Nearctic Females of Tabanus—Continued*

118. Hind tibia dark reddish brown to black, with black hair  
*sexfasciatus* Hine, p. 141.
119. Hind tibia reddish yellow or yellow, with concolorous hair----- 119  
 Abdominal bands broad, formed by yellow hair on a broad  
 border of yellow pollen; prescutal lobe reddish  
*zonalis* Kirby, p. 142.
120. (116) Abdominal bands consisting of a narrow fringe of pale yellow  
 hair; prescutal lobe black-----*aequetinctus* Becker, p. 143. 121  
 Second palpal segment slender, scarcely thickened basally----- 121  
 Second palpal segment not particularly slender, the base always  
 rather distinctly thickened----- 126
121. Subcallus denuded; basal callus distinctly transverse; proboscis  
 elongate; sides of abdomen orange  
*longiglossus* Philip, p. 144.
122. Subcallus pollinose; basal callus subquadrate; proboscis of mod-  
 erate length or, if elongate, sides of abdomen not orange--- 122  
 Femora, except base of hind femur, orange brown  
*minuscus* Hine, p. 145.
123. Femora black----- 123  
 Proboscis elongate, the palpus not reaching base of labellae  
*hearlei* Philip, p. 146.
124. Proboscis not elongate, the palpus reaching beyond base of  
 labellae----- 124  
 Prescutal lobe black; base of third antennal segment narrow;  
 hair of palpus rather long and uneven----- 125
125. Prescutal lobe reddish; third antennal segment not very narrow;  
 hair of palpus short-----*typhus* Whitney, p. 148. 125  
 Second palpal segment yellow brown, with black hair; third  
 antennal segment with some orange basally  
*astutus* Osten Sacken, p. 146.
126. (120) Second palpal segment creamy white, with white hair basally;  
 third antennal segment black-----*boreus*, new species, p. 147. 127  
 Abdomen black, with a median row of conspicuous white tri-  
 angles and no sublateral spots-----*trispilus* Wiedemann, p. 149. 127  
 Abdomen not so colored----- 127
127. Furcation with a distinct brown spot; third antennal segment  
 rather stout, the dorsal excision rather distinct; (body  
 stout) ----- 128  
 Furcation without a distinct spot, or third antennal segment  
 elongate and slender, with scarcely any excision above----- 129
128. Subcallus pollinose-----*illotus* Osten Sacken, p. 150. 128  
 Subcallus denuded-----*metabolus* McDunnough, p. 151. 129
129. (127) Subcallus pollinose, with some black pile laterally; black species,  
 the lateral abdominal spots evanescent  
*laniferus* McDunnough, p. 151.
130. Pile absent from subcallus laterally, or, if present, the lateral  
 abdominal spots distinct or subcallus not pollinose----- 130  
 Frons very broad, with parallel sides; frontal callus transverse,  
 twice as broad as median height; (prescutal lobe black) --- 131  
 Frons moderate in width; frontal callus subquadrate----- 132
131. Subcallus denuded; hair of palpus white; pale, sublateral, ab-  
 dominal spots lacking-----*oklahomensis* Stone, p. 140. 131  
 Subcallus pollinose; hair of palpus black; pale sublateral spots  
 present-----*laticallus* Philip, p. 152. 132
132. (130) Subcallus denuded----- 133  
 Subcallus pollinose----- 138
133. Prescutal lobe black----- 134  
 Prescutal lobe yellowish brown----- 135
134. Second tergite laterally partially black  
*rhombicus* Osten Sacken, p. 153.
135. (133) Second tergite laterally entirely orange in ground color  
*rhombicus* var. *rupestris* McDunnough, p. 154. 136  
 Femora partially or wholly yellow brown----- 136  
 Femora uniformly dark, with gray pollen----- 137

Key to Nearctic Females of *Tabanus*—Continued

136. Stout species about 12 mm in length; sublateral abdominal spots yellowish; no stump vein present—*fretus*, new species, p. 154.  
More slender species, 13 mm or more in length; sublateral abdominal spots grayish; a rather long stump vein from vein R<sub>4</sub> usually present—*liorhinus* Philip, p. 155.
137. (135) Stump vein from vein R<sub>4</sub> usually present; length 15 mm or more; subcallus rarely entirely denuded; frons usually over three and one-half times as high as width at base  
*hirtulus* Bigot, p. 159.  
Stump vein usually absent; length 14 mm or less; subcallus entirely denuded; frons about three times as high as width at base—*melanorhinus* Bigot, p. 156.
138. (132) Legs nearly uniformly yellowish brown; (second palpal segment stout at base, but tapering to a slender apex; dorsal angle of third antennal segment inconspicuous)----- 139  
Femora entirely black or grayish----- 141
139. Prescutal lobe black; frons rather narrow  
*microcephalus* Osten Sacken, p. 156.  
Prescutal lobe reddish; frons broad----- 140
140. Sublateral abdominal spots rather broadly surrounded by orange brown; frons about three times as high as basal width; subcallus dark brown; costal cell brownish; hind tibial fringe black—*brennani*, new species, p. 157.  
Abdomen without much orange brown laterally; frons about twice as high as basal width; subcallus yellowish brown; costal cell hyaline; hind tibial fringe largely white  
*itasca* Philip, p. 158.
141. (138) Prescutal lobe black; stout species, with a faint spot at furcation and considerable orange brown on sides of tergites  
*atrobasis* McDunnough, p. 159.  
Prescutal lobe usually reddish brown, or, if black, more slender species, with little reddish laterally on tergites----- 142
142. Length 15 mm or more; a stump vein near furcation usually present; pollen of head gray—*hirtulus* Bigot, p. 159.  
Length usually less than 15 mm; stump vein rarely present; part of head usually faintly tinged with yellowish----- 143
143. Frons rather broad and distinctly widened above; sublateral, pale, abdominal spots distinct, oblique, yellowish brown, their median markings usually slightly concave—*opacus* Coquillett, p. 160.  
Frons narrower and scarcely widened above; sublateral pale spots variable, but if distinct and yellowish, more nearly round, with median margins straight or convex----- 144
144. Sublateral abdominal spots large, contiguous and yellowish  
*frontalis* Walker, p. 161.  
Sublateral abdominal spots small, usually grayish and not contiguous—*septentrionalis* Loew, p. 162.

Key to Nearctic Males of *Tabanus*

1. Eye bare----- 2  
Eye pilose----- 55
2. Hair on mid line between eye-----*carolinensis* Macquart, p. 126.  
No hair between eyes----- 3
3. Abdomen unicolorous or with narrow, indistinct, pollinose bands-- 4  
Abdomen not unicolorous; if bands are present, they are broad and distinct----- 15
4. Palpus orange brown to white----- 5  
Palpus dark brown to black----- 7
5. Furcation with a distinct brown spot-----*imitans* Walker, p. 86.  
Furcation not margined with brown----- 6
6. Hind tibial fringe orange; wing mostly hyaline  
*americanus* Forster, p. 83.  
Hind tibial fringe black; wing dilute brownish  
*giganteus* Degeer, p. 84.
7. (4) Furcation without an infuscated spot although the whole wing may be dark----- 8  
Furcation with a distinct brown spot----- 10

Key to Nearctic Males of *Tabanus*—Continued

8. Wing heavily infuscated----- 9  
 Wing hyaline or nearly so-----*aegrotus* Osten Sacken, p. 90.
9. Wing black-----*atratus* Fabricius, p. 87.  
 Wing yellowish along posterior margin  
*atratus* var. *nantuckensis* Hine, p. 89.
10. (7) Scutellum and lateral margins of mesoscutum with white pile  
*punctifer* Osten Sacken, p. 93. 11  
 Scutellum and lateral margins of mesoscutum without white pile-- 11
11. Genae gray-----*proximus* Walker, p. 91. 12  
 Genae dark brown----- 12
12. Wing dark brownish-----*nigrescens* var. *atripennis* Stone, p. 93. 13  
 Wing subhyaline, yellowish----- 13
13. Antenna, including annulate portion, orange-----*stygius* Say, p. 94. 14  
 Antenna, or at least annulate portion, blackish----- 14
14. Lower margin of area of large facets of eye about on level with  
 top of antennal pits-----*subniger* Coquillett, p. 95. 14  
 Lower margin of area of large facets somewhat higher  
*nigrescens* Palisot, p. 92.
15. (3) Abdomen orange brown, with a median dark stripe; (wing fumose  
 or spotted with brown)-----*fumipennis* Wiedemann, p. 96. 16  
 Abdomen either with conspicuous bands or with a median stripe  
 or row of pale spots, with or without sublateral spots----- 16
16. A median row of pale triangles or spots on abdomen not forming a  
 parallel-sided stripe; no distinct sublateral spots although  
 there may be broad bands which tend to obliterate the median  
 triangles----- 17  
 Abdomen otherwise marked----- 33
17. Very distinct, white, median triangles on tergites 3-5 and rarely  
 a faint one on tergite 2; fore tibia bicolored; venter of abdo-  
 men with a distinct, median, brown stripe; furcation and cross  
 veins faintly margined with brown-*trimaculatus* Palisot, p. 96. 18  
 Not as above----- 18
18. Furcation not margined with brown----- 19  
 Furcation with a more or less distinct brown spot----- 26
19. Scutellum with distinct white pollen and pile, contrasting with the  
 darker base of abdomen; (costal cell yellowish brown)  
*molestus* Say, p. 97. 20  
 Scutellum without white pollen and pile except around margin--- 20
20. Frontal triangle denuded and somewhat protuberant  
*coffeatus* Macquart, p. 100. 21  
 Frontal triangle not denuded or swollen----- 21
21. Median triangles of abdomen nearly obliterated by very broad, pale  
 bands nearly covering tergites 3 and 4; thorax very dark brown  
 in contrast to pale abdomen; scutellum dark, with pale margin;  
 costal cell hyaline-----*rufokrater* Walker, p. 101. 22  
 Not with this combination of characters----- 22
22. Median triangle on tergite 2, if present, much smaller than those  
 on 3 and 4-----*superjumentarius* Whitney, p. 99. 23  
 Median triangles on tergites 2-4 of about equal size----- 23
23. Upper facets of eye not much larger than those below  
*giganteus* Degeer, p. 84. 24  
 Upper facets of eye much larger than those below, the line of  
 differentiation pronounced----- 24
24. Femora black-----*melanocerus* Wiedemann, p. 106. 25  
 Femora orange brown----- 25
25. Frontal triangle, clypeus, and genae grayish white; fore tibia some-  
 what paler basally than apically; abdomen rather broadly  
 orange brown laterally, the median row of triangles on a  
 narrow, blackish, median stripe--*actaeon* Osten Sacken, p. 103.  
 Frontal triangle, clypeus, and genae yellowish brown; fore tibia  
 uniform in color; abdomen uniformly dark reddish brown  
 except for median row of small, pale triangles  
*catenatus* Walker, p. 102.



Key to Nearctic Males of *Tabanus*—Continued

26. (18) Venter of abdomen with rather broad bands along posterior margins of sternites, distinctly paler than basal portions of sternites... 27  
 Venter of abdomen nearly uniformly brownish, the apical pale bands narrow and not contrasting... 29
27. Stump vein from vein  $R_4$ .....*lacustris* Stone, p. 104. 28  
 No stump vein from vein  $R_4$ .....
28. Tibiae bright orange, with concolorous hair.....*trijunctus* Walker, p. 107.  
 Tibiae otherwise.....*endymion* Osten Sacken, p. 108.
29. (26) Costal cell hyaline.....*equalis* Hine, p. 113. 30  
 Costal cell distinctly colored..... 31
30. Legs nearly uniformly orange brown..... 31  
 At least femora black..... 32
31. Abdomen orange brown, the median triangles not very distinct, that on second tergite with a narrow black spot anterior to it.....*cheliopaterus* Rondani, p. 109.  
 Abdomen dark brown, with narrow, elongate, whitish triangles.....*recedens* Walker, p. 110.
32. (30) Areas of large and small facets of eye distinctly differentiated.....*sulcifrons* Macquart, p. 114.  
 Facets of eye nearly uniform in size, the areas not sharp differentiated.....*gladiator* Stone, p. 85.
33. (16) Some tergites with three pale spots; spots of median row sometimes contiguous but not forming a parallel-sided stripe..... 34  
 Abdomen with a well defined, parallel-sided, median, pale stripe..... 50
34. Wing mottled with brown, the spots not confined to cross veins or furcation; tergites 2-4 with posterior white bands nearly obliterating the median and sublateral spots, but the spots distinct on tergite 4.....*venustus* Osten Sacken, p. 78. 35  
 Not with this combination of characters.....
35. Furcation and cross veins margined with brown.....*cymatophorus* Osten Sacken, p. 80.  
 Wing entirely hyaline or with a faint spot at furcation only, or all veins faintly margined with brown..... 36
36. Fore tibia entirely black.....*nivosus* Osten Sacken, p. 64. 37  
 Fore tibia pale, at least on basal half.....
37. No median white spot on tergite 2, but spots on tergites 3 and 4 very conspicuous; sublateral spots oblique and those on tergites 4-6 indistinct; first antennal segment with a well developed dorsal angle.....*dorsifer* Walker, p. 56. 38  
 Not with this combination of characters.....
38. Blackish species, 10 mm or less in length; costal cell hyaline; sublateral abdominal spots rounded and usually completely separated from posterior margins of tergites..... 39  
 Brownish, yellowish, or blackish species, 12 mm or more in length, or, if less, the costal cell brown; sublateral abdominal spots usually reaching posterior margins on some tergites..... 40
39. Third antennal segment with distinct dorsal angle; (eastern part of the United States).....*pumilus* Macquart, p. 75.  
 (western part of the United States).....*sparus* Whitney, p. 77.  
 Third antennal segment slender, without distinct dorsal angle; (western part of the United States).....*fratellus* Williston, p. 76.
40. (38) Costal cell dark brown or deep yellow..... 41  
 Costal cell hyaline or faintly tinged with yellow..... 43
41. Antenna entirely light orange.....*zythicolor* Philip, p. 69.  
 Antenna with basal portion of third segment orange, annulate portion black..... 42
42. Sublateral abdominal spots angular and contiguous.....*texanus* Hine, p. 70.  
 Sublateral abdominal spots rounded and not touching hind margins of tergites.....*longiusculus* Hine, p. 71.
43. (40) Hair and pollen of pleura yellow; areas of large and small facets of eye weakly differentiated.....*fulvulus* Wiedemann, p. 55.

*Key to Nearctic Males of Tabanus—Continued*

- Hair of pollen and pleura grayish; areas of large and small facets of eye rather distinctly differentiated----- 44
44. Sublateral abdominal spots large, yellow; hair of thoracic dorsum yellow----- 45
- Sublateral abdominal spots smaller, rarely reaching anterior margin of tergites, pale brownish gray; hair of mesonotum gray----- 46
45. Antenna entirely orange----*fulvulus* var. *pallidescens* Philip, p. 56. Annulate portion of third antennal segment black----- 46
46. (44) Third antennal segment uniformly orange brown; (southeastern part of the United States)-----*gracilis* Wiedemann, p. 68. Annulate portion of third antennal segment distinctly darker than basal portion, or whole segment dark----- 47
47. Third antennal segment slender; first antennal segment not enlarged; (no spot at furcation)----- 48
- Third antennal segment not slender; first segment somewhat enlarged----- 49
48. Third antennal segment extremely elongate, the basal portion orange, annulate portion black-----*sackeni* Fairchild, p. 72. Third antennal segment moderately elongate, black except at extreme base-----*vivax* Osten Sacken, p. 67.
49. (47) Blackish, the antenna entirely black; no spot at furcation; palpus very stout-----*pruinosis* Bigot, p. 65. Brown, the antenna largely orange; a faint spot at furcation; palpus rather slender-----*abactor* Philip, p. 69.
50. (33) A distinct spot at furcation-----*acutus* (Bigot), p. 117. No spot at furcation----- 51
51. Annulate portion of third antennal segment as long as basal portion; costal cell colored, sometimes faintly; prescutal lobe usually concolorous with rest of mesonotum----- 52
- Annulate portion of third antennal segment shorter than basal portion; costal cell hyaline; prescutal lobe usually paler than rest of mesonotum----- 54
52. Palpus, pleura, and costal cell strongly yellow-----*vicarius* Walker, p. 117. Palpus white, pleura grayish, costal cell variable----- 53
53. Costal cell deep brown; small species, with dark abdomen-----*mularis* Stone, p. 121. Costal cell rather pale yellowish; abdomen broadly yellowish brown laterally-----*nigrovittatus* Macquart, p. 120.
54. (51) Scutellum entirely black in ground color-----*lineola* Fabricius, p. 122. Apex of scutellum reddish-----*lineola* var. *scutellaris* Walker, p. 123.
55. (1) Hair on mid line between eyes-----*oklahomensis* Stone, p. 140. No hair between eyes----- 56
56. Abdomen with a yellowish-gray, parallel-sided, median stripe----- 57
- Abdomen not so colored----- 58
57. Palpus small; hind femur entirely gray; hair of mesonotum strongly yellow-----*bishoppi* Stone, p. 53. Palpus moderate in size; at least apical third of hind femur reddish; hair of mesonotum nearly white-----*truquii* Bellardi, p. 123.
58. (56) Vertex pollinose and hairy----- 59
- Vertex usually denuded of pollen; hair confined to posterior half, or, if hair on anterior half, the posterior hair very long and curved forward----- 67
59. Furcation and cross veins margined with brown----- 60
- Furcation and cross veins not margined with brown----- 61
60. Eye densely pilose; areas of large and small facets not sharply differentiated; rather large species-----*reinwardtii* Wiedemann, p. 82. Eye sparsely pilose; areas of large and small facets sharply differentiated; smaller species-----*monoensis* Hine, p. 81.
61. (59) First antennal segment considerably swollen above----- 62
- First antennal segment not very swollen above----- 63

*Key to Nearctic Males of Tabanus*—Continued

62. Side of abdomen above and venter largely orange brown  
*erythraeus* (Bigot), p. 58.  
 Side of abdomen above black, venter gray  
*fairchildi*, new species, p. 63.
63. (61) All femora pale reddish-----*orbicallus* Philip, p. 59. 64  
 At least fore femur dark brown to black-----
64. Antenna orange except for black annulate portion; basal portion  
 very stout-----*euryceras* Philip, p. 65. 65  
 Antenna not so colored or formed-----
65. Hind tibial fringe white-----*intensivus* Townsend, p. 60. 66  
 Hind tibial fringe black-----
66. Venter with abundant black hair medianly  
*gilanus* Townsend, p. 61.  
 Venter with no black hair medianly anterior to apex of fifth  
 sternite-----*laticeps* Hine, p. 62.
67. (58) Rather small, blackish, the frontal triangle gray, protuberant;  
 genae black, subshiny; wing with a brown cloud in stigmal  
 region-----*hinei* Johnson, p. 124. 68  
 Not agreeing entirely with above-----
68. Black species, with tergites 1-3 and sternites 1-4 mostly orange,  
 the remainder entirely black-----*cinctus* Fabricius, p. 125. 69  
 Abdomen not so colored-----
69. Entirely black including palpus; frontal triangle, clypeus, and  
 genae shiny black-----*procyon* Osten Sacken, p. 127. 70  
 Not entirely black-----
70. Cross veins and furcation distinctly margined with dark brown;  
 (sides of tergites 1-4 largely orange and usually with oblique  
 yellow spots superimposed)-----*lasiophthalmus* Macquart, p. 128. 71  
 Cross veins and furcation not both distinctly margined with dark  
 brown-----
71. Abdomen broadly orange brown laterally, the median black area  
 usually constricted on tergite 3; sublateral pale spots not  
 conspicuous----- 72  
 Abdomen not broadly orange laterally; if paler laterally, the  
 median dark area rather broad and not constricted on tergite  
 3; sublateral pale spots, if present, distinct and with little  
 if any orange brown surrounding them----- 85
72. Under 15 mm in length; pale median spots on central black area  
 forming a slender, usually continuous line; a large, quadrate,  
 black spot on second sternite reaching posterior margin;  
 (Atlantic coast)-----*daecke*i Hine, p. 135. 73  
 Not agreeing entirely with this-----
73. Small, dark species, the orange on sides of abdomen confined to  
 first three tergites and leaving a broad, median, black area;  
 palpus very small, the second segment about one-fourth length  
 of proboscis-----*longiglossus* Philip, p. 144. 74  
 Not agreeing entirely with this-----
74. Third antennal segment largely orange, this color extending more  
 than half length of basal portion along lower margin----- 75  
 Third antennal segment black except extreme base of basal portion----- 83
75. Large and small facets of eye somewhat differentiated, in dried  
 specimens a yellowish band at lower margin of area of larger  
 facets-----*trepidus* McDunnough, p. 131. 76  
 Facets scarcely differentiated, the eye without a yellowish band-----
76. Second palpal segment stout, whitish or pale yellowish----- 77  
 Second palpal segment moderately slender to stout, yellowish brown----- 79
77. First sternite entirely orange or orange with a small, median, black  
 spot-----*epistates* Osten Sacken, p. 136. 78  
 First sternite entirely black or with a little orange sublaterally at  
 posterior margin-----
78. Claws of fore tarsus subequal; a faint spot at furcation  
*metabolus* McDunnough, p. 151.  
 Outer claw of fore tarsus distinctly longer than inner claw; no  
 spot at furcation-----*nudus* McDunnough, p. 138.



*Key to Nearctic Males of Tabanus—Continued*

79. (76)	Second sternite entirely orange-----	80
	Second sternite orange, with a black median spot-----	82
80.	Prescutal lobe black-----	81
	Prescutal lobe orange----- <i>affinis</i> Kirby, p. 137.	
81.	Orange on dorsum of abdomen not extending beyond tergite 3----- <i>rhombicus</i> var. <i>rupestris</i> McDunnough, p. 154.	
	Orange extending onto tergite 4----- <i>atrobasis</i> McDunnough, p. 159.	
82. (79)	More than 13 mm long; third antennal segment with dorsal excision rather deep----- <i>gracilipalpis</i> Hine, p. 132.	
	Less than 12 mm long; third antennal segment with dorsal excision very shallow----- <i>minusculus</i> Hine, p. 145.	
83. (74)	Venter with black hair rather sparse, and, at least sublaterally, a considerable amount of yellowish hair-----	84
	Venter with only black hair----- <i>sonomensis</i> var. <i>phaenops</i> Osten Sacken, p. 134.	
84.	Second sternite with a large black spot medianly; second palpal segment stout, but apex not acute----- <i>sonomensis</i> Osten Sacken, p. 133.	
	Second sternite with scarcely any black medianly; second palpal segment stout, with apex acute----- <i>haemaphorus</i> McDunnough, p. 137.	
85. (71)	Abdomen with transverse bands; little or no indication of median or sublateral spots-----	86
	Abdomen entirely dark or with distinct median or sublateral spots or both-----	88
86.	Hind tibia dark reddish brown to black, with dark hair----- <i>sexfasciatus</i> Hine, p. 141.	
	Hind tibia reddish yellow or yellow, with concolorous hair-----	87
87.	Abdominal bands broad, formed by yellow hair on a broad border of yellow pollen; prescutal lobe reddish----- <i>zonalis</i> Kirby, p. 142.	
	Abdominal bands consisting of a narrow fringe of pale yellow hair; prescutal lobe black----- <i>aequetinctus</i> Becker, p. 143.	
88. (85)	Abdomen black, dull reddish laterally, with a median row of conspicuous white triangles and no sublateral spots----- <i>trispilus</i> Wiedemann, p. 149.	
	Abdomen not so colored-----	89
89.	Furcation with a distinct brown spot----- <i>illotus</i> Osten Sacken, p. 150.	
	Furcation without a distinct brown spot-----	90
90.	Prescutal lobe black-----	91
	Prescutal lobe orange-----	94
91.	Femora brown----- <i>microcephalus</i> Osten Sacken, p. 156.	
	Femora black-----	92
92.	Second palpal segment stout, distinctly larger than first-----	93
	Second palpal segment small, subequal to first----- <i>astutus</i> Osten Sacken, p. 146.	
93.	Sublateral abdominal spot on tergite 2 indistinct or absent; hair of clypeus and genae entirely black----- <i>laniferus</i> McDunnough, p. 151.	
	Sublateral abdominal spot on tergite 2 distinct; hair of clypeus and lower genae white----- <i>rhombicus</i> Osten Sacken, p. 153.	
94. (90)	Hair of genae and pleura entirely white----- <i>fretus</i> , new species, p. 154.	
	Hair of genae and pleura not entirely white-----	95
95.	Frontal triangle denuded----- <i>melanorhinus</i> Bigot, p. 156.	
	Frontal triangle pollinose-----	96
96.	A stump at base of vein R <sub>1</sub> -----	97
	No stump at base of vein R <sub>1</sub> -----	98
97.	Femora black----- <i>hirtulus</i> (Bigot), p. 159.	
	Femora yellow brown----- <i>liorhinus</i> Philip, p. 155.	
98. (96)	Palpus rather stout, pale yellow----- <i>opacus</i> Coquillett, p. 160.	
	Palpus slender, orange brown----- <i>typhus</i> Whitney, p. 148.	

The following species are not included in the key to the males, either because this sex is unknown or because it is not well enough described to permit inclusion in the key: *abdominalis*, *aurilimbus*,

*birdiei*, *boreus*, *brennani*, *californicus*,<sup>5</sup> *captonis*,<sup>5</sup> *cayensis*, *coarctatus*, *imitans* var. *excessus*, *exilipalpis*, *frontalis*, *fulvicallus*, *atratus* var. *fulvopilosus*, *fuscicostatus*, *hearlei*, *itasca*, *johnsoni*, *laticallus*, *laticornis*, *longus*, *moderator*, *morbosus*, *nefarius*, *petiolatus*, *philipi*, *quaesitus*, *septentrionalis*, *sequax*, *turbidus*, and *wiedemanni*.

#### TABANUS BISHOPPI Stone

(Fig. 14, A)

*Tabanus bishoppi* Stone, Ent. Soc. Wash. Proc. 35: 77, 1933, and 37: 16, 1935.

Rather small; yellowish brown, with a parallel-sided, yellowish, median stripe and subquadrate, sublateral spots on abdomen; eye pilose; ocellar tubercle absent; palpus very slender.



FIGURE 14.—Antenna, front view of head, and palpus of (A) *Tabanus bishoppi* and (B) *T. quaesitus*.

**Female.**—Length 11–13 mm. Eye with short but distinct white pile, greenish blue, with a single, yellow-green, diagonal stripe. Frons about three and one-half times as high as width at base, scarcely widened above, yellow, with brown hair above median callus, yellow hair below; small, slightly raised spot at vertex entirely covered with pollen and hair; basal callus black, shiny, convex, subquadrate, and narrowly separated from eyes; median callus black, usually very slender and elongate and very narrowly joined to basal callus; subcallus flat, pale yellowish. First two antennal segments small, yellowish brown, with black hair above; third orange brown, the annulate portion black; basal portion stout, its greatest width nearly equal to length, only slightly excised beyond obtuse dorsal angle; length of annulate portion equal to width of basal portion. Clypeus and genae white, with concolorous hair. Palpus pale yellow, with short white and scattered black hair, the second segment of moderate width at base but apical half very slender.

Mesonotum black in ground color, with a very fine coating of yellow pollen and an indication of grayish stripes on mesoscutum; hair black and yellow, the latter predominating. Pleura, sternum, and coxae dark gray, the fore coxa paler than others; upper part of pleura with yellowish hair, the rest white. Wing hyaline, the reddish-brown veins darker apically; venation normal. Femora gray; tibiae yellow, with yellow hair, the apical third of fore tibia blackened; fore tarsus black, the middle and hind tarsi dark reddish brown.

Abdomen with a continuous pale-yellow stripe from base to apex, which widens slightly at posterior margin of each tergite; on tergite 1 a black spot at each side of stripe, and an indication of black bordering the stripe on other tergites, the apex of abdomen largely black; rest of abdominal dorsum rather dark orange brown except for a sublateral row of nearly square spots of yellow pollen and hair on tergites 1–5, the spots beyond first tergite not touching hind margin; venter pale orange, somewhat darker apically.

**Male.**—Eye densely pilose, the facets nearly uniformly small. Frontal triangle gray, distinctly swollen, with a pair of small brown spots at top of swelling, which touch eyes. Second palpal segment rather slender, with pale hair. Abdomen yellower than in female, the lateral spots somewhat larger.

**Type and paratype.**—Females, United States National Museum No. 49378.

<sup>5</sup> The males of *californicus* and *captonis* have been described by Philip (17) since the completion of this paper. The male of *quaesitus* has been discovered and its description included although it was found too late to be included in the key.

*Type locality*.—Silver Springs, Fla.

*Distribution*.—Florida. March 3 (Gulfport) to May 9 (Lake City). In the United States National Museum, two females, two males.

**TABANUS QUÆSITUS, new species**

(Fig. 14, B)

Small; brownish, with three rows of grayish spots on abdomen, the median spots very slender, the sublateral spots subquadrate and usually separated from hind margins of tergites; eye pilose; antenna and palpus slender; subcallus pollinose.

*Female*.—Length 10–12 mm. Eye rather sparsely but distinctly pilose. Frons gray tinged with yellow, with a mixture of black and yellowish hair, about two and one-half times as high as basal width, parallel sided or slightly narrowed above; basal callus shiny, dark brown, protuberant, transverse, and touching eyes; median callus a narrow line slightly widened above and usually joined to basal callus; at vertex a subquadrate, partially denuded area with a slight median tubercle; subcallus slightly protuberant, light gray, tinged with yellow. First two antennal segments yellow, with black hair, the first not swollen above; third black, the basal half of basal portion sometimes orange brown; basal portion slender, with a blunt dorsal angle slightly basad of middle, and a moderate excision; annulate portion stout, slightly shorter than basal portion. Clypeus and genae whitish tinged with yellow above, with white hair. Palpus slender, pale yellowish, the second segment with some scattered black hair. Proboscis slightly longer than palpus.

Mesonotum dark brownish, with faint gray stripes, yellowish, recumbent hair, and black, erect hair. Wing, including costal cell, hyaline; veins dark brown, the venation normal. Legs yellowish brown, with a mixture of black and yellowish hair, the apical half of fore tibia, extreme apices of others, and the tarsi darkened.

Abdomen blackish brown, with a faint, narrow, median, yellowish stripe and rather large, sublateral, subquadrate, whitish spots, usually separated from the narrow yellow hind margins on tergites 2–5 or 2–6; venter nearly uniformly yellowish gray.

*Male*.—Eyes with rather dense, long pile. Vertex pollinose, with a few hairs. Third antennal segment slender, orange brown, the annulate portion darker. Second palpal segment nearly twice as long as thick, the apex blunt. Proboscis nearly as long as height of head. Apices of the tibiae and the tarsi only slightly darkened. Coloration otherwise essentially as in female.

*Type*.—Female, in the collection of the University of Kansas. Allotype male in the collection of Ohio State University; two female paratypes in the United States National Museum (No. 51960).

*Type locality*.—Colorado County, Tex.

Holotype collected April 11 and paratypes April 5 and 12, 1922, all by Mrs. Grace Wiley, at the type locality. Allotype collected on horse at Montgomery, La., June 20, 1923, by W. G. Bradley.

**TABANUS EXILIPALPIS, new species**

(Fig. 15, A)

Small, stout; dark brownish, the abdomen with a pale-brownish pattern consisting of a narrow median line and round, isolated, sublateral spots; wing hyaline; frons rather narrow, parallel sided; third antennal segment stout; palpus very slender.

*Female*.—Length 11 mm. Eye with rather short, sparse pile, green, with a slender, diagonal, purple band. Frons yellowish brown, darkened at level of median callus, about four times as high as wide, with nearly parallel sides; basal callus orange brown, subquadrate, touching eyes; median callus a very narrow black line, slightly longer than basal callus; at vertex a flat, denuded, brown area not touching eyes; subcallus white, faintly tinged with yellowish. First two antennal segments yellowish brown, with black hair, the first not strongly swollen above; basal portion of third dull orange, its greatest width



slightly over two-thirds its length, with a distinct midventral angle, a prominent but obtuse dorsal angle, and a rather shallow excision; annulate portion nearly black, rather stout, slightly longer than width of basal portion. Clypeus and genae white, with white hair. Second palpal segment creamy white, with concolorous hair and a few black ones, the base of moderate thickness, but apical portion very slender. Proboscis only slightly longer than palpus.

Mesonotum dark brown, with upright black hair and whitish recumbent hair; mesoscutum with faint, lighter-brown stripes in usual pattern; humeral and prescutal lobes light brownish. Pleura, sternum, and coxae gray, tinged with brownish, the hair white. Wing hyaline; venation normal. Legs yellowish brown, with mostly white hair, all tibiae at apex and the tarsi dark brown.



FIGURE 15.—Antenna, front view of head, and palpus of (A) *Tabanus exilipalpis* and (B) *T. fulvulus*.

Dorsum of abdomen dark brown, the tergites with very narrow, light-brown hind margins, a narrow median line, and round sublateral spots on tergites 2-6 not touching hind margins; venter almost uniformly grayish.

*Male*.—Unknown.

*Type*.—Female, United States National Museum No. 51961.

*Type locality*.—Beaufort, S. C. The type was collected by A. H. Jennings, May 25, 1912.

#### TABANUS FULVULUS Wiedemann

(Fig. 15, B)

*Tabanus fulvulus* Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, p. 153, 1828; Osten Sacken (in part), Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 451-452, 1876; Hine, La. Agr. Expt. Sta. Bull. 93: 49, 1907; Fairchild, Boston Soc. Nat. Hist. Occas. Papers 8: 140-141, 1934; Philip, Ohio Jour. Sci. 36: 150-151, 1936.

*Tabanus fulvofrater*, Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, pp. 181-182, 1848. (New synonymy.)  
? *Tabanus mutatus* Walker, Insecta Saundersiana, Diptera, v. 1, pp. 23-24, 1850.

Medium sized; yellowish, with three rows of yellow spots on abdomen, the median spots contiguous; mesoscutum without distinct stripes; no spot at furcation; third antennal segment with basal portion orange, annulate portion black; frons narrow and widened above.

*Female*.—Length 12-16 mm. Eye bare, green, with three purple bands, the upper one at level of median callus and strongly curved upward, median one from basal callus diagonally nearly to outer margin, and lower one from corner of subcallus, fading outwardly. Frons bright yellow, with a mixture of short black and yellow hair, about five times as high as width at base, somewhat widened above; basal callus shiny black or brownish, somewhat higher than wide and nearly touching eyes; median callus about as long as basal callus but distinctly separated from it; no ocellar tubercle; subcallus and top of genae bright yellow; lower genae and clypeus grayer, with pale-yellowish hair. Antenna bright orange except black annulate portion; first two segments with a mixture of short black and yellow hair; third rather broad at base, with a distinct dorsal angle and moderate dorsal excision; annulate portion slightly shorter than width of basal portion. Second palpal segment moderately broad at base, tapering to a sharp apex, bright yellow, with yellow hairs and occasionally a few black ones.

Mesonotum black, tinged with yellow and covered with yellow hair, giving it an olive-green color; a few black hairs on prescutal lobe. Pleura, sternum, and coxae gray tinged with yellow, with pale-yellowish hair. Wing hyaline, the

costal cell tinged with yellow; venation normal. Femora black, with gray pollen and pale hair, the extreme apices orange yellow; tibiae yellow orange, the apex of fore tibia black; fore tarsus black, the middle and hind tarsi dark except most of first segment.

Abdomen orange brown, grading to black apically, with three rows of orange-yellow spots, those of median row contiguous and widening posteriorly on each segment; sublateral spots on second tergite reaching length of tergite; those posteriorly smaller, usually separated from margins; venter yellowish, sometimes darker medianly.

*Male*.—Large and small facets of eye not greatly differing in size, and area of larger facets not extensive. General coloration as in female, but yellow of abdomen somewhat more extensive so that the darker color is often confined to a narrow stripe along outer margin and a double row of inwardly curved spots.

*Type*.—In the Vienna Museum.

*Type locality*.—"America?"

*Distribution*.—New Jersey to Florida. May 12 (Monticello, Fla.) to July 27 (Manamuskin, N. J.). In the United States National Museum, 28 females, 5 males.

The writer has seen a specimen of *fulvulus*, said by Hine to agree with the type of *fulvofrater* Walker. The original description of *mutatus* Walker makes its synonymy probable, although the type must be studied before a final decision can be made. Hine was unable to find the type in the British Museum and Smart has suggested that it may be in the Hope Museum at Cambridge.

#### TABANUS FULVULUS variety PALLIDESCENS Philip

*Tabanus fulvulus* var. *pallidescens* Philip, Ohio Jour. Sci. 36: 150-151, 1936.

*Female and male*.—Paler than typical *fulvulus*, with legs entirely pale yellow and pleura grayish.

*Type*.—Female, in the collection of C. B. Philip. Allotype male in the collection of Ohio State University; paratypes in these collections.

*Type locality*.—Blue Mountains, Miss.

*Distribution*.—Maryland to Florida and Missouri to Louisiana. April 18 (Wakulla, Fla.) to July 11 (Plummers Island, Md.). In the United States National Museum, eight females.

#### TABANUS DORSIFER Walker

(Fig. 16, A)

*Tabanus dorsifer* Walker, Ent. Soc. London Trans. 5: 273, 1860; Philip, Bull. Brooklyn Ent. Soc. 31: 191, 1936.

*Tabanus servittatus* Bigot, Mem. Soc. Zool. France 5: 682, 1892.

*Tabanus hyalinipennis* Hine, Canad. Ent. 35: 244-245, 1903; Hine, Ohio Nat. 5: 238, 1904.

Rather small; blackish brown and white, with large, white, median triangles on third and fourth tergites, but none on second; first antennal segment about as wide apically as basal portion of third segment.

*Female*.—Length 13-15 mm. Eye bare. Frons about four times as high as width at base, somewhat widened to top of median callus, gray, with a patch of brown medianly; basal callus square, dull reddish brown to black; median callus rather broad, spindle shaped, joined narrowly, if at all, to basal callus; subcallus pale brown. Antenna black; first segment with a rather prominent dorsal angle; basal portion of third segment rather short and stout, with a strong dorsal angle but only a slight dorsal excision; annulate portion nearly as long as basal portion. Clypeus and genae below antennae white, with long white hair. Second palpal segment short, stout at base, yellowish white, with white hair.

Mesoscutum dark, with five pale-reddish stripes; prescutal lobe reddish; scutellum dark discally, reddish around margin; pleura and sternum gray, somewhat reddish on mesopleura, with white hair. Wing entirely hyaline, with dark veins; venation normal. Legs dark, with mostly whitish pile, the basal half of fore tibia and most of middle and hind tibiae orange brown; hind tibial fringe long, white except at darkened apex.

Abdomen black, with a white median spot on first tergite, a pair of sub-lateral, oblique, whitish spots tinged with reddish on tergites 2-4, those on second prominent, a distinct median white triangle on tergite 3 reaching nearly half way to anterior margin, and a larger median triangle extending the length of tergite 4; all tergites with narrow white posterior borders, that on second slightly expanded medianly; venter dark gray, with hind margins of sternites whitish.

*Male*.—Eye somewhat flattened above, the differentiation between the areas of large and small facets marked, the small facets extending around margin to vertex. Dorsal projection of first antennal segment very prominent. Coloration throughout essentially as in female.



FIGURE 16.—Antenna, front view of head, and palpus of (A) *Tabanus dorsifer* and (B) *T. laticornis*.

Described from males from Arizona and Texas.

*Type*.—Female, in the British Museum.

*Type locality*.—Mexico.

*Distribution*.—Arizona to Texas; Mexico. May 16 (Uvalde, Tex.) to October 9 (Santa Catalina Mountains, Ariz.). In the United States National Museum, eight females, six males.

The types of both *Tabanus dorsifer* Walker and *T. sexvittatus* Bigot were examined by Hine and in his manuscript notes are declared to be the same species as his *T. hyalinipennis*. *T. picturatus* (Kröber) from Venezuela is remarkably like this species, but the eye of the male in *picturatus* is described as being composed of small facets only, and there are slight differences in the abdominal pattern.

#### TABANUS LATICORNIS Hine

(Fig. 16, B)

*Tabanus laticornis* Hine, Ohio Nat. 5: 239-240, 1904.

Rather small; blackish, with side of abdomen broadly orange; basal portion of third antennal segment orange, very short and stout, with no excision, apical portion black; frons rather broad.

*Female*.—Length 13-16 mm. Eye densely pilose, purple, with a slender, diagonal, green band across middle at level of basal callus, a slender green band below, and a broad green spot near top. Frons gray tinged with yellow, about three and one-half times as high as width at base, widened above; basal callus shiny black, subquadrate, not touching eyes; median callus narrow, black, narrowly joined to basal callus; ocellar tubercle very small, not surrounded by denuded area; subcallus and upper margin of genae pale yellow; rest of genae and clypeus pale gray, with white hair. First two antennal segments yellowish or gray, with black hair, the first rather stout; third with basal portion orange, sometimes blackish apically, short and compact, about as wide as long, with no dorsal excision, the upper angle blunt; annulate portion black, about equal in length to basal portion. Second palpal segment pale creamy, with white and black hair, rather stout at base, gradually tapering to a narrow apex.



Mesonotum dull black, with yellowish-brown and white pile; prescutal lobe reddish. Pleura, sternum, and coxae gray, with white hair. Wing hyaline, the costal cell yellowish; venation normal. Femora yellowish brown to black; tibiae yellowish brown, the apex of fore tibia darker; hind tibial fringe black; tarsi dark brown.

Abdomen black medianly, with a faint median line of yellowish triangles, the median black stripe widening on each segment; tergites 1-4 orange brown laterally, with paler-brown oblique spots next to the median black stripe; tergites 5-7 entirely black; venter mostly yellowish brown, darker apically and medianly.

*Male*.—Eye densely pilose, the upper facets distinctly larger than the lower facets, the line of differentiation distinct; antenna with basal portion of third segment not unusually stout, annulate portion considerably longer than basal; frontal triangle yellowish gray. Body color essentially as in female.

*Cotypes*.—In the collection of Ohio State University. At least one female that is probably from the original series is in the United States National Museum.

*Cotype localities*.—Arizona and northern Mexico.

*Distribution*.—Arizona to Chihuahua. July 17-20 (Mud Springs, Santa Catalina Mountains, Ariz.). In the United States National Museum, five females.

#### TABANUS ERYTHRAEUS (Bigot)

(Fig. 17, A)

*Atylotus erythraeus* Bigot, Mem. Soc. Zool. France 5: 661, 1892. (Not *Tabanus erythraeus* Bigot, *ibid.*, pp. 687-688.)

*Tabanus erythraeus* Philip, Bull. Brooklyn Ent. Soc. 31: 191-192, 1936.

Rather small, slender; orange brown and black, with the abdomen strongly tinged with orange brown and with three rows of grayish triangles; first antennal segment enlarged.

*Female*.—Length 13-15 mm. Eye with very short, fine pile. Frons nearly four times as high as width at base, slightly widened above, yellowish, grayer at vertex; no ocellar tubercle; basal callus orange to dark brown, nearly as broad as long and narrowed above; a very slender, short, median callus of same color, which may or may not be joined to basal callus; subcallus creamy yellow. First antennal segment cream colored, with coarse black hair and much swollen above so that it is wider apically than widest part of third segment; second segment small, with a distinct dorsal process, orange brown, with black hair; third segment orange brown at extreme base, but annulate portion and most of basal portion black; basal portion about two-thirds as wide as long, with prominent dorsal angle and a distinct excision; annulate portion about as long as width of basal portion. Clypeus and genae gray, with white hair. Second palpal segment of moderate width basally, tapering to a blunt apex, cream colored, with coarse black and fine white hair.

Mesonotum dark gray, the mesoscutum with stripes of yellowish hair in usual pattern; prescutal lobe reddish, with black hair. Pleura reddish above, the rest of thorax and coxae gray, with whitish hair. Wing hyaline, with dark-brown veins, the venation normal. Fore femur black, the others reddish brown; tibiae yellowish, except the black apical half of fore tibia; fore tarsus black, the others dark reddish brown.

Abdomen dark brown medianly, orange brown laterally, with three rows of gray spots; the median spots consisting of a small one on first tergite and a row of contiguous triangles each with base on posterior margin and just touching anterior margin; sublateral spots oblique, broadly touching hind margin of each tergite; venter dull orange brown, darker apically.

*Male*.—Eye with distinct, short pile, but this not much more dense than in female; facets of eye nearly uniform in size, the upper, larger ones not sharply differentiated from the lower ones; first antennal segment very prominent; second palpal segment cream colored, the tip acute and slightly curved downward. Coloration as in female, the abdomen with somewhat more orange brown.

Described from six males, from the Pinaleno and Santa Rita Mountains in Arizona and Animas Peak, N. Mex.

*Type*.—Female, in the British Museum.

*Type locality*.—Mexico.

*Distribution*.—Arizona, Mexico. July 17 (Pinaleno Mountains, Ariz.) to July 25 (Horse Camp Canyon, Ariz.). In the United States National Museum, 21 females, 6 males.

This species superficially resembles *T. abactor* Philip, but differs in having pilose eyes, enlarged first antennal segment, black on basal portion of third antennal segment, and no spot at furcation. The writer has seen a specimen compared with the type of *erythraeus* by E. E. Austen. This species should not be confused with *Tabanus erythraeus* Bigot from Argentina, described in the same paper but on page 687. The latter has been synonymized with *T. monochroma* Wiedemann by Kröber (11).



FIGURE 17.—Antenna, front view of head, and palpus of (A) *Tabanus erythraeus* and (B) *T. orbicallus*.

*Tabanus rubescens* Bellardi (not Macquart) from Oaxaca has been considered a synonym of *erythraeus* (Bigot), but the writer is inclined to doubt it. He has seen a series of one female and five males from Cuernavaca that are very close to *erythraeus*, but the abdominal spots are slightly yellower and less extensive, there is black medianly on the abdomen, and the male palpus is blunt apically. It would seem more probable that this is *rubescens* Bellardi.

#### TABANUS ORBICALLUS Philip

(Fig. 17, B)

*Tabanus orbicallus* Philip, Canad. Ent. 68: 157–159, 1936.

Rather small; dusty grayish, with three rows of pale spots on abdomen; legs uniformly yellowish; eye pilose; no distinct ocellar tubercle; frons broad and widened above.

*Female*.—Length 13–15 mm. Eye with rather sparse, short pile, green blue, with one rather broad purple band. Frons yellowish brown, grayer just above and below median callus, about three times as high as width at basal callus, widened above; basal callus chestnut brown to black, subquadrate, convex, not quite touching eyes; median callus of same color, elliptic, narrowly joined to basal callus; sometimes a small, brownish, denuded spot at vertex, but no ocellar tubercle; subcallus with thin yellowish-brown pollen over a concolorous surface. First two antennal segments orange brown, with black hair, the first not enlarged; basal portion of third orange basad of the blunt dorsal angle, black beyond it, the dorsal excision shallow; annulate portion about as long as basal portion. Clypeus and genae white, with white hair. Palpus cream colored, with white hair and sometimes a few black hairs, the second segment distinctly swollen basally, tapering to a narrow apex.

Mesonotum gray, with an indication of paler stripes in usual pattern and a mixture of white, golden, and black hair; prescutal lobe orange brown. Pleura, sternum, and coxae yellowish brown, with long white hair, the pleura partially grayish. Wing hyaline; venation normal. Legs almost uniformly yellowish brown, the tarsi and apex of fore tibia darker.

Dorsum of abdomen blackish, with a median row of slender gray triangles and large, oblique, yellowish-brown triangles at each side; venter yellowish brown with some gray.

*Male*.—Eye densely pilose, the areas of large and small facets rather well differentiated; antenna scarcely smaller than in female; second palpal segment cream colored, with white hair, rather stout, with apex acute. Coloration of body essentially as in female, but coxae, bases of femora, and abdomen below grayish.

*Type*.—Female, in the collection of C. B. Philip. Allotype male, United States National Museum No. 51962; paratypes in the Canadian National Collection, in the collections of the University of Nebraska and Kansas State College, and in the collection of C. B. Philip.

*Type locality*.—Gove County, Kans.

*Distribution*.—South Dakota, Nebraska, Kansas, Oklahoma, and Iowa. June 12 (Yankton, S. Dak.) to July 7 (Ness County, Kans.). In the United States National Museum, two females, two males.

#### TABANUS INTENSIVUS Townsend

(Fig. 18, A)

*Tabanus intensivus* Townsend, Psyche 8: 93, 1897; Hine, Ohio Nat. 5: 238–239, 1904.

*Tabanus gilanus* Rowe and Knowlton (not Townsend), Canad. Ent. 67: 241, 1935.

Rather small; grayish, with three rows of large gray spots on abdomen; femora black; hind tibial fringe predominantly white; first antennal segment not swollen above; third elongate, mostly black; eye pilose; no distinct ocellar tubercle; palpus stout.

*Female*.—Length 12–15 mm. Eye with short, pale pile, purple, with two green bands. Frons gray, usually tinged with yellow or brown at level of median callus, about three times as high as width at base, slightly widened above; basal callus shiny brown to black, distinctly convex, subquadrate, nearly touching eyes; median callus about one-third width of frons, about height of basal callus and usually joined to it by a line; vertex usually with an irregular denuded spot, but no distinct tubercle; subcallus yellowish brown, with thin gray pollen. First antennal segment not enlarged, yellowish gray, with mostly black hair; second gray, with distinct dorsal process; third black, the basal half sometimes with considerable orange; dorsal angle of basal portion low, obtuse, the excision shallow; basal portion about two-thirds as wide as long, the annulate portion slightly shorter than basal portion. Clypeus and genae white, with white hair. Second palpal segment very stout basally, tapering to an acute apex, white haired, often with some scattered black hair.

Mesonotum blackish, with gray stripes in usual pattern, erect black hair, and recumbent yellowish-white to golden hair; prescutal lobe yellowish brown, with black hair. Pleura, sternum, and coxae light gray, with white hair. Wing entirely hyaline, the veins orange brown; venation normal. Femora black, with gray pollen; tibiae yellowish brown, the apical half of fore tibia and extreme apices of others black; hind tibial fringe white, with a few scattered black hairs; tarsi black.

Abdomen black above, with three rows of pale-gray spots, the sublateral spots frequently tinged with reddish; median spots contiguous, narrowed anteriorly, widened posteriorly, occasionally joining sublateral spots posteriorly; sublateral spots oblique, extending length of each tergite; venter gray, with pale hair and, medianly, some black hair.

*Male*.—Eye short pilose, the areas of large and small facets rather distinctly differentiated; second palpal segment moderately stout, with acute apex. Body coloration throughout as in female.

*Cotypes*.—Two females, collection unknown.

*Type locality*.—West Fork, Gila River, Ariz.

*Distribution*.—Washington and Montana to New Mexico. June 8 (Logan, Utah) to August 14 (Las Vegas, N. Mex.). In the United States National Museum, 28 females, 1 male.



It is quite apparent from the drawing given by Rowe and Knowlton that they had *T. intensivus* before them and not *T. gilanus*.

**TABANUS GILANUS Townsend**

(Fig. 18, B)

*Tabanus gilanus* Townsend, Psyche 8: 92-93, 1897; Hine, Ohio Nat. 5: 238, 1904.

Rather small; blackish, with three rows of pale spots on abdomen above; a considerable amount of black hair on venter; wing hyaline; hind tibial fringe black; eye pilose.

*Female*.—Length 13-15 mm. Eye with short pile, purple, with two green bands. Frons gray, tinged with yellow brown opposite median callus, about three times as high as basal width, slightly widened above; basal callus shiny chestnut brown to black, subquadrate or rounded, somewhat protuberant; median callus an irregular, subshiny, black area narrowly joined to basal callus; usually a partially denuded, brownish spot at vertex, but no distinct tubercle; subcallus yellowish brown, denuded or thinly pollinose. First two antennal segments yellowish, with black hair, the first not noticeably enlarged; third black beyond dorsal angle, orange basally; dorsal angle distinct but obtuse above, the excision shallow; annulate portion about as long as basal portion. Clypeus and genae white, with white hair, the latter, near subcallus, yellowish brown, with an admixture of black hair. Palpus pale yellow orange, with white hair, the second segment stout basally, tapering to an acute apex; some black hair on second segment.

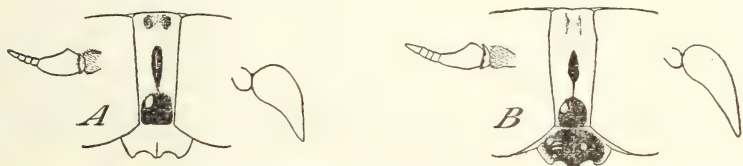


FIGURE 18.—Antenna, front view of head, and palpus of (A) *Tabanus intensivus* and (B) *T. gilanus*.

Mesonotum blackish, with five narrow gray stripes in usual pattern; prescutal lobe, upper half of mesopleurite, and extreme base of fore coxa reddish; rest of pleura and coxae gray, with white hair. Wing entirely hyaline, with brown veins; venation normal. Femora gray; tibiae reddish, the apical half of fore tibia black and apices of others darkened; hind tibial fringe black; tarsi blackish.

Abdomen blackish, with a median row of gray spots slightly widened at posterior margins of tergites, and somewhat larger, oblique, sublateral spots, those on second tergite not touching anterior margin; sublateral spots sometimes tinged with reddish; venter gray, tinged with reddish laterally, darkened medianly, the median stripe with black hair.

*Male*.—Eye with sparse, short pile, the facets of upper portion much larger than those below, but the line of differentiation not distinct; frontal triangle brownish, with thin gray pollen; palpus about twice as long as thick, the apex truncate. Body coloration essentially as in female.

Described from a specimen in the United States National Museum from Monrovia Canyon, Calif., August 2, 1931, collected by Charles H. Martin.

*Cotypes*.—Two females, collection unknown.

*Type locality*.—West Fork, Gila River, Ariz.

*Distribution*.—Southern California, Arizona, New Mexico, and Colorado. June 28 (Poudre River Canyon, Colo.) to August 2 (Monrovia Canyon, Calif.). In the United States National Museum, four females, one male.

The recognition of this species is based upon a specimen collected on a horse at Rio Ruidoso (about 6,500 feet), White Mountains, N. Mex., by Townsend and compared with the types either by Townsend or Coquillett. *Tabanus gilanus* has sometimes been confused with *T. intensivus* but can be distinguished by the less extensive light gray on the abdomen and by the black hind tibial fringe.

**TABANUS LATICEPS Hine**

(Fig. 19, A)

*Tabanus laticeps* Hine, Ohio Nat. 5: 239, 1904.

Rather small; grayish, with three rows of spots on abdomen, the sublateral spots oblique, the median spots slender but expanding at hind margins of tergites; frons rather wide; subcallus yellowish and somewhat shiny.

*Female*.—Length 13 mm. Eye with rather sparse, short pile, purple, with two rather broad green bands. Frons yellowish gray tinged with orange at level of median spot, about three times as high as width at basal callus and distinctly widened above; basal callus shiny chestnut brown to black, slightly wider than high, rounded, not quite touching eyes and narrowly joined to the concolorous median callus; the latter about half width and slightly longer than height of basal callus; vertex with a large, shiny, black or brown spot, not

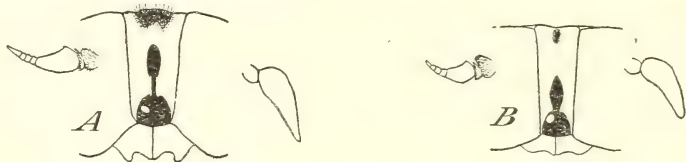


FIGURE 19.—Antenna, front view of head, and palpus of (A) *Tabanus laticeps* and (B) *T. fairchildi*.

bearing a distinct ocellar tubercle; subcallus and top of genae yellowish brown, the former either with thin pollen or denuded. Clypeus and rest of genae white, with white hair. First two antennal segments yellow orange, with black hair, the first not swollen above; third reddish from base to dorsal angle, black beyond, the dorsal angle and dorsal excision slight; annulate portion slightly longer than width and shorter than length of basal portion. Second palpal segment stout at base and tapering to a rather slender apex, creamy white, with white hair and a few scattered black ones.

Mesonotum black, with rather distinct grayish or brownish stripes in usual pattern; prescutal lobe reddish. Pleura, sternum, and coxae gray, with white hair. Wing hyaline throughout, the veins brown, venation normal. Femora black; basal half of fore tibia yellowish, with pale hair, apical half dark, with black hair; middle and hind tibiae orange brown, scarcely darkened at apices; hind tibial fringe black; tarsi dark brown, the fore tarsus darkest.

Abdomen dark brown, with three rows of light-yellowish-brown spots and sometimes the ground color orange brown on side of abdomen basally; the median row of spots consisting of a small round spot on first tergite and T-shaped spots on tergites 2-4, the horizontal bar of each T resting on hind margin of tergite; sometimes faint indication of similar pattern on tergites beyond fourth; sublateral spots oblique, touching hind margin, and extending to lateral margin, of each tergite; venter a mixture of gray and reddish.

*Male*.—Eye with dense, short pile, the upper and lower facets not greatly different in size but the line of differentiation rather distinct. Frontal triangle flat, rather dark brownish, the upper half denuded. Rest of body coloration as in female.

*Cotypes*.—In the collection of Ohio State University. A male and a female in the United States National Museum are probably part of the original series.

*Cotype localities*.—California and Washington.

*Distribution*.—Washington to Los Angeles, Calif., and New Mexico. April 27 (Berkeley, Calif.) to August 11 (Seattle, Wash.). In the United States National Museum, nine females, two males.

**TABANUS FAIRCHILD, new species**

(Fig. 19, B)

*Tabanus vivax* authors (not Osten Sacken). Hine, Ohio Nat. 4: 1-2, 1903; Ohio State Acad. Sci. Spec. Papers 5: 56-57, 1903; U. S. Dept. Agr., Bur. Ent. Tech. Ser. 12: 32-34, 1906; Schwardt, Jour. Kans. Ent. Soc. 4: 13-14, 1931; Ark. Agr. Expt. Sta. Bull. 332: 57, 1936.

Medium sized; dark gray, with three rows of gray spots on abdomen; antenna black, the first segment distinctly swollen above; wing hyaline; hair of hind tibia white.

*Female*.—Length 13-16 mm. Eye bare or with very sparse, short pile, green, with a single narrow, diagonal, purple band. Frons three and one-half to four times as high as width at base, slightly widened above, gray, with brown on each side of median callus and tinged with yellow below it, with black hair, and a few yellowish hairs below median callus; basal callus dark brown to black, shiny, subquadrate, below as wide as frons and slightly narrowed above; median callus black, about as long as basal callus and narrowly joined to it; vertex with abundant black hair, and often with a denuded black spot, but no tubercle. Subcallus yellowish brown, somewhat swollen. First antennal segment orange brown to black, densely clothed with black hair, somewhat swollen above, as wide as basal portion of third segment and somewhat projecting forward over second; third entirely black, with a distinct dorsal angle at base and only a slight excision; basal portion longer than wide, the annulate portion intermediate in length between length and width of basal portion. Clypeus and genae below antennae light gray, with white hair. Second palpal segment stout, tapering to a point, white, with black and white hair.

Mesoscutum and scutellum black, the former with narrow gray stripes of pollen; vestiture consisting of erect black hair, recumbent orange hair, and some erect white hair along anterior margin, above wing base and around scutellum; prescutal lobe reddish, with black hair. Pleura, sternum, and coxae gray, with white hair. Wing entirely hyaline, with dark-brown veins and stigma; venation normal. Femora gray, with white hair; tibiae pale reddish brown except for apical half of fore tibia and extreme apices of middle and hind tibiae, which are black; pale portions of tibiae with white hair, the hind tibial fringe well developed; tarsi dark reddish brown to black.

Dorsum of abdomen black, with three rows of gray spots, a round spot on first tergite, followed by a row of distinct gray triangles, the triangle on second tergite largest and the others progressively smaller posteriorly; sublateral spots smaller, somewhat oblique, and not touching hind margins of tergites beyond second; venter gray, with whitish incisures, somewhat darker medianly.

*Male*.—Eye with areas of large and small facets not strongly differentiated, and the former not extensive; palpus stout, with blunt apex, usually grayish. Abdomen with sublateral gray spots larger than in female, those on second tergite considerably larger than median triangle and tinged with reddish. Coloration otherwise as in female.

*Type*.—Female, United States National Museum No. 51963. Allotype male and 16 female and 1 male paratypes, United States National Museum No. 51963; 6 female and 2 male paratypes, in the collection of Ohio State University; 1 male paratype in the Museum of Comparative Zoology.

*Type locality*.—Taghanic, Ithaca, N. Y.

*Distribution*.—Type collected June 21, 1920; allotype, June 5, 1917, Great Falls, Va. (C. T. Greene); paratypes, New York, 9; Pennsylvania, 1; New Jersey, 1; Maryland, 1; Virginia, 2; District of Columbia, 1; Florida, 1; Ohio, 5; Indiana, 2; Kentucky, 2; Oklahoma, 1. May 6 (reared from larva taken along Scioto River, Ohio) to August



21 (McCurtain County, Okla.). Specimens from Connecticut and Arkansas have also been seen.

Graham Fairchild pointed out to the writer that the type male of Osten Sacken's *Tabanus vivax* does not agree with the species called *vivax* by Hine and others. The writer takes great pleasure in naming this long recognized, but misdetermined, "river horsefly" in his honor. This species is remarkable in that the entire larval stage is spent under stones in rapidly running water, whereas the larvae of most species live in mud.

**TABANUS NIVOSUS Osten Sacken**

(Fig. 20, A)

*Tabanus nivosus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 445-446, 1876; Cameron, Bull. Ent. Research 17: 32-33, 1926; Stone, Ann. Ent. Soc. Amer. 23: 298, 1930; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 31, 112, 1931.

Rather small, stout; brownish black, with three rows of white spots on abdomen, the sublateral spots very large and the median triangles very small; no spot at furcation.

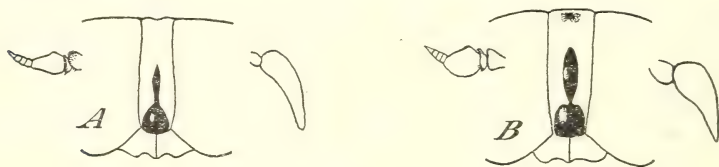


FIGURE 20.—Antenna, front view of head, and palpus of (A) *Tabanus nivosus* and (B) *T. euryceras*.

*Female*.—Length 11-14 mm. Eye bare. Frons brownish gray, darker at level of median callus, three to three and one-half times as high as width across basal callus, with nearly parallel sides; basal callus yellowish to dark brown, flat and somewhat roughened, square and not touching eyes; median callus a slender, somewhat darker projection from basal callus reaching about to middle of frons; subcallus and upper genae light brown. First two antennal segments yellow brown, with black hair; third dark brown to black, with scarcely any excision and dorsal angle distinct but obtuse; annulate portion slightly shorter than basal portion. Clypeus and genae light gray, with white hair. Second palpal segment light yellowish brown, with black and yellowish-brown hair, moderately stout at base and tapering to a slender apex.

Mesonotum black, with orange-brown prescutal lobe and brownish-gray lines in usual pattern. Pleura, sternum, and coxae yellowish brown to dark gray, with mostly white hairs except on supraepimeron, where they are black. Wing hyaline, the veins brown; venation normal. Legs yellowish brown to dark brown, the femora, apices of tibiae, and the tarsi darkened; hair of tibiae mostly white, the hind tibial fringe weak.

Abdomen dark brown to black, with white markings consisting of a median row of very small triangles and sublateral rows of large, oblique spots, the sublateral spot on second tergite broadly touching both anterior and posterior margins; sublateral spots often tinged with yellowish brown; venter dark gray.

*Male*.—Areas of large and small facets of eye distinctly but not greatly differentiated. Whole head brownish, with brownish hair. Pleura and sternum dark brownish, with dark-brown hair. Legs darker than in female. Abdominal coloration as in female.

*Type*.—The female herein designated as the lectotype from a pair in the Museum of Comparative Zoology (No. 4041).

*Type locality*.—New Jersey.

*Distribution*.—Alberta and Nova Scotia to Colorado and New Jersey. May 26 (Lyme, Conn.) to August 18 (Macdiarmid, Lake Nipigon, Ontario). In the United States National Museum, 22 females, 3 males.

**TABANUS EURYCERAS Philip**

(Fig. 20, B)

*Tabanus euryceras* Philip, Pan-Pacific Ent. 13: 66-67, 1937.

Rather small; grayish, with three rows of spots on abdomen; eye bare; third antennal segment with very stout orange basal portion and black annulate portion.

*Female*.—Length 12 mm. Eye bare. Head gray, the frons and subcallus tinged with yellow. Frons about four times as high as width at base, distinctly widened above; basal callus dark orange brown, subquadrate; median callus black, narrowly joined to basal callus; vertex with a somewhat denuded spot but no ocellar tubercle. Antenna orange, the annulate portion of third segment black; first two segments with black hair, the first slightly swollen above; second with a strong dorsal process; basal portion of third very stout, with no dorsal excision, the width nearly as great as the length. Clypeus and genae with white hair. Second palpal segment very stout basally, tapering to an acute apex, pale yellow brown, with a mixture of whitish and black hair.

Mesonotum blackish, with rather distinct grayish lines in the usual pattern; prescutal lobe and area above wing base reddish brown; pleura, sternum, and coxae gray, with white hair; wing hyaline, veins brown, venation normal. Femora gray; tibiae yellowish brown, the apical half of fore tibia blackened; hind tibial fringe a mixture of black and white; tarsi orange brown to black, the fore pair darkest.

Abdomen grayish above, the sides tinged with dull reddish; a median row of small grayish triangles arising from pale bands on hind margins; a row of sublateral, oblique spots on each side extending length of tergites; venter dull orange brown.

*Male*.—Areas of large and small facets of eye sharply differentiated, the former with short pile; vertex with thin gray pollen and with hair over entire surface. Upper third of frontal triangle brown, the rest gray. Palpus yellowish, with mostly white hair, the second segment about twice as long as thick, with blunt apex. Claws of fore tarsus subequal. Coloration of body essentially as in female.

*Type*.—A female in the collection of the University of Kansas. *Allotype* and paratype male in the collection of the University of Kansas; paratype female in the collection of the University of Arizona; paratype male and paratype female in the collection of C. B. Philip.

*Type locality*.—Santa Rita Mountains, Ariz.

*Distribution*.—Arizona. June 12 (Santa Rita Mountains) to August (southern Arizona).

**TABANUS PRUINOSUS Bigot**

(Fig. 21, A)

*Tabanus pruinus* Bigot, Mem. Soc. Zool. France 5: 683-684, 1892.

*Tabanus limpidipennis* Hine, Ohio Nat. 8: 223, 1907. (New synonymy.)

Medium sized; dark grayish brown, with three rows of small grayish spots on abdomen; wing entirely hyaline; third antennal segment mostly black; palpus stout, pale pinkish.

*Female*.—Length 16-17 mm. Eye bare or finely pilose, with two green bands. Frons gray tinged with yellowish brown on each side of median callus, slightly over three and one-half times as high as width at base, somewhat widened above; basal callus chestnut brown, subcircular, not quite touching eyes; median callus black, narrowly joined to basal callus, short and often ill defined; a pair of small yellowish-brown spots at vertex, but no ocellar tubercle. Subcallus orange brown covered with yellowish pollen. Antenna orange brown

except third segment beyond dorsal angle, which is black; first two segments with black hair, the first somewhat enlarged above; second with strong dorsal process; basal portion of third short and stout, the dorsal angle strong and excision shallow. Clypeus and genae gray, with mostly white hair. Second palpal segment stout, rather long, pale pinkish, with mixed white and black hair.

Mesonotum dark gray, with brownish prescutal lobe, paler gray lines in usual pattern, recumbent rusty hair, and erect black hair. Pleura, sternum, and coxae gray, with white hair. Wing entirely hyaline, with black veins, the venation normal. Femora gray, with white hair; tibiae pale reddish, with white hair except the black apical half of fore tibia and darkened apices of others; hind tibial fringe white except at apex; tarsi dark brownish black.

Abdomen gray tinged with reddish, with a row of faint, pale-grayish, median triangles and sublateral, oblique, gray spots on tergites 2-5, the latter not reaching the hind margins of tergites; venter dark grayish red, with a broad, nearly black, median stripe.

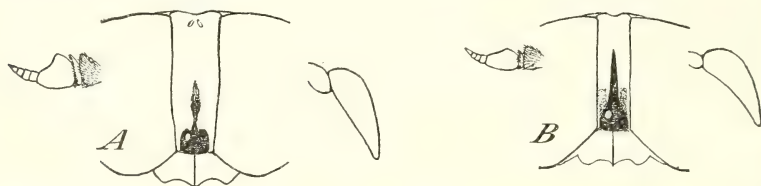


FIGURE 21.—Antenna, front view of head, and palpus of (A) *Tabanus pruinosus* and (B) *T. fulvicallus*.

*Male*.—Areas of large and small facets of eye not strongly differentiated, the latter extensive and widely surrounding the larger facets; antenna black, the first segment distinctly enlarged; second palpal segment cream colored, stout, with apex acute. Coloration otherwise as in female.

*Type*.—Male; in the British Museum, according to Hine, although recent search failed to discover it.

*Type locality*.—Mexico.

*Distribution*.—Utah to Guatemala. May (Jemez Spring Mountains, N. Mex.) to July 29 (Tucson, Ariz.).

Hine, in his unpublished notes made at the British Museum, claims to have studied the type and places his *Tabanus limpidipennis* as a synonym.

This species is very close to *fairchildi*, n. sp., but the first antennal segment of the female is not quite so enlarged, the third segment has some reddish basally, and the sublateral gray spots on the abdomen of the male are less extensive than in *fairchildi*.

#### TABANUS FULVICALLUS Philip

(Fig. 21, B)

*Tabanus fulvicallus* Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 106-107, 1931; Fairchild, Boston Soc. Nat. Hist. Occas. Papers 8: 143, 1934; Stone, Ent. Soc. Wash. Proc. 37: 17, 1935.

Rather small to medium sized; brownish, with three rows of pale spots on abdomen; third antennal segment mostly blackish brown, the extreme base and last annulus paler.

*Female*.—Length 11.5-16 mm. Eye bare. Frons gray tinged with yellow, slightly more than four times as high as wide, with parallel sides; vertex notched, slightly swollen, and sometimes denuded in front of notch, but with no ocellar tubercle; basal callus rather small, narrowly separated from eyes, and tapering to the slender, raised, median callus; subcallus pale yellowish brown, rather flat. Antenna with first two segments, extreme base of third, and last



annulus orange brown, the remainder blackish; first segment rather large but not strongly swollen above; basal portion of third with a slight obtuse angle above and scarcely any dorsal excision. Clypeus and genae nearly white, with white hair. Second palpal segment creamy yellow brown, with black hair on apical two-thirds, moderately long, slightly swollen basally, and tapering to a blunt apex.

Mesonotum brown, with faint paler lines in usual pattern. Pleura, sternum, and coxae paler. Wing hyaline, with brown veins, the venation normal. Legs light orange brown, with pale yellowish hair, the fore femur, fore tibia apically, and tarsi darker; hind tibial fringe sparse, with few black hairs.

Abdomen above orange brown, darker apically, with three rows of pale spots; the median spots on tergites 3-5 triangular, with somewhat concave sides and reaching length of tergites; sublateral oblique spots present, but faint, on tergites 1-6; venter orange brown, somewhat darker medianly and apically.

*Male*.—Unknown.

*Type*.—Female, in the collection of the University of Minnesota. Paratype in the collection of the University of Minnesota.

*Type locality*.—Lake Minnetonka, Minn.

*Distribution*.—Minnesota to New York. July 6 (Point Pelee, Ontario) to July 30 (Lake Minnetonka, Minn.). In the United States National Museum, two females.

#### TABANUS VIVAX Osten Sacken

(Fig. 22, A)

*Tabanus vivax* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 446-447, 1876.

*Tabanus arborealis* Stone, Ent. Soc. Wash. Proc. 37: 14-15, 1935. (New synonymy.)

Medium sized; dark brown to black, with three rows of gray triangles on abdomen, the median row most conspicuous, the median triangle on second tergite not reaching anterior margin; wing hyaline; first antennal segment not swollen above.

*Female*.—Length 14-15 mm. Eye bare. Frons yellowish brown, with black hair, about three and one-half times as high as wide, the sides parallel; vertex flat, pollinose, with no ocellar tubercle; basal callus orange brown, rather small, distinctly separated from eyes, slightly higher than wide and narrowed above; median callus nearly black, broadly joined to basal callus and tapering to a point at upper third of frons; subcallus slightly swollen, yellowish brown. First two antennal segments dark reddish brown, with black hair; the first not strongly swollen above; third black, with an inconspicuous dorsal angle and very shallow dorsal excision, the annulate portion longer than the width, but shorter than the length, of basal portion. Clypeus and genae light gray, with white hair. Second palpal segment reddish brown, with black hair, the length and width moderate.

Mesonotum dark brown, with lines in the usual pattern and humeral and prescutal lobes paler. Pleura, sternum, and coxae gray. Wing hyaline, with brown veins, the venation normal. Legs dark reddish brown, with grayish pollen, the fore femur, apices of tibiae, and the tarsi nearly black; hind tibial fringe sparse, entirely black.

Abdomen above dark brown, with three rows of nearly white spots, the median spots on tergites 2-4 triangular, not quite reaching length of tergites, sublateral spots oblique, faint on tergites 1 and 3, lacking or extremely faint on 4-7; venter dark brown, with white hair, the sutures narrowly whitish.

*Male*.—Eye bare, the areas of large and small facets sharply differentiated; frontal triangle flat, pollinose; extreme base of third antennal segment orange; second palpal segment pale yellowish, with some black hair apically, about twice as long as thick, the apex blunt. Body coloration essentially as in female.

*Type*.—A male from Trenton Falls, N. Y., one of two male cotypes, Museum of Comparative Zoology No. 4042, herein designated as lectotype.

*Type locality*.—Trenton Falls, N. Y.

*Distribution*.—Quebec and Newfoundland to Massachusetts. July 12 (Mexico, Maine) to September 3 (Baddeck, Cape Breton Island, Nova Scotia). In the United States National Museum, seven females.

The description of *arboREALIS* was published some time before the writer was persuaded that the *Tabanus vivax* Osten Sacken of Hine was not the same as the true *T. vivax* Osten Sacken. It now becomes necessary to sink *arboREALIS*. For a discussion of the species Hine misdetermined, see *T. fairchildi* (p. 64).



FIGURE 22.—Antenna, front view of head, and palpus of (A) *Tabanus vivax* and (B) *T. gracilis*

#### TABANUS GRACILIS Wiedemann

(Fig. 22, B)

*Tabanus gracilis* Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, pp. 156–157, 1828; Osten Sacken, Smithsn. Misc. Collect. No. 270, p. 228, 1878; Williston, Kans. Acad. Sci. Trans. 10: 140–141, 1887; Philip, Ohio Jour. Sci. 36: 153, 1936.

Rather small, slender; brown, with three rows of paler triangles on abdomen; costal cell nearly hyaline; longitudinal veins of wing faintly bordered with brown; frons rather broad; basal portion of third antennal segment orange and rather short and broad.

*Female*.—Length 11–16 mm. Eye bare. Frons brownish gray, parallel-sided, about three times as high as wide; basal callus shiny yellowish brown, not quite touching eyes, and tapering to a concolorous median callus of about same length; subcallus concolorous with frons. First two antennal segments yellowish, the first not swollen above; third orange, the basal portion rather short and broad, with a distinct dorsal angle and only a shallow dorsal excision; annulate portion about as long as basal portion. Clypeus and genae whitish, with white hair. Second palpal segment rather slender, yellowish brown, with white and black hair.

Mesonotum orange brown, with gray lines; rest of thorax and coxae gray. Wing hyaline, the costal cell and margins of all veins washed with brown; venation normal. Legs yellowish brown, the tarsi and apices of tibiae darker.

Abdomen yellowish brown, with three rows of paler-brownish-gray triangles; median triangles usually not quite reaching to anterior margins of tergites; sublateral triangles each with base on hind margin of tergite, the inner edges parallel to each other, the outer edges oblique; venter dull orange brown.

*Male*.—Areas of large and small facets of eye sharply differentiated. Body coloration as in female.

Described from two specimens, one collected at Fort Meade, Fla., August 13, 1930, by P. W. Oman and one at Fort Monroe, Va., August 16, 1928, by C. N. Smith.

*Type*.—Female, collection unknown.

*Type locality*.—Savannah, Ga.

*Distribution*.—Virginia to Florida. May 24 (Indiantown, Fla.) to December 23 (Pinellas County, Fla.). In the United States National Museum, 93 females, 2 males.

This is one of the most abundant species in the southeastern part of the United States.

## TABANUS ZYTHICOLOR Philip

(Fig. 23, A)

*Tabanus zythicolor* Philip, Ohio Jour. Sci. 36: 152-153, 1936.

Rather small; orange brown, with a median row of slender contiguous spots and sublateral round spots on abdomen; third antennal segment orange, not very elongate; basal callus brown; frons moderately narrow, with parallel sides.

*Female*.—Length 11-14 mm. Eye bare, green, with two purple bands. Frons yellowish brown, parallel sided, three and one-half to four and one-half times as high as wide; basal callus shiny yellowish to chestnut brown, usually touch-



FIGURE 23.—Antenna, front view of head, and palpus of (A) *Tabanus zythicolor* and (B) *T. abactor*.

ing eyes and slightly higher than wide; median callus dark brown to black, joined to basal callus by a narrow line or completely separated; subcallus yellowish brown. Antenna uniformly orange, the first two segments with black hair; third moderately stout basally, with distinct dorsal angle and scarcely any dorsal excision; annulate portion slightly longer than width of basal portion. Clypeus and genae, except the brownish upper corners, gray, with white hair. Second palpal segment creamy white to yellowish brown, with black hair, moderately stout at base, tapering to a rather narrow apex.

Mesonotum brown, with pale-yellowish, recumbent hair and short, black, erect hair. Pleura, sternum, and coxae gray, with white hair. Wing subhyaline, the costal cell yellowish brown; venation normal. Legs yellowish brown, the middle and hind tibiae paler, fore tibia usually somewhat darkened apically, and apical tarsal segments darker.

Abdomen above dark orange brown, with a median row of slender yellowish-brown spots, which expand at posterior margin of each tergite, and oblique, elliptical, sublateral spots usually narrowly separated from hind margin of tergites; venter nearly uniformly brown.

*Male*.—Areas of large and small facets of eye not sharply differentiated; second palpal segment pale yellow, about twice as long as thick, with blunt apex. Body coloration essentially as in female, but slightly darker.

*Type*.—Female, in the collection of C. B. Philip. Allotype, collection of C. B. Philip; paratypes in the Ohio State Museum, the Museum of Comparative Zoology, the Rocky Mountain Spotted Fever Laboratory, Hamilton, Mont., and the United States National Museum (No. 51964).

*Type locality*.—Oakdale, N. C.

*Distribution*.—Virginia to Florida and Oklahoma. July 6 (Monticello, Fla.) to September 18 (Georgetown, S. C.). In the United States National Museum, 31 females.

## TABANUS ABACTOR Philip

(Fig. 23, B)

*Tabanus abactor* Philip, Ohio Jour. Sci. 36: 153-154, 1936.

*Tabanus gracilis* Sanborn, Stiles, and Moe (not Wiedemann), Okla. Agr. Expt. Sta. Bull. 204, 1932.

Rather small; brown, with three rows of pale triangles on abdomen; basal portion of third antennal segment orange, moderately stout, with a distinct dorsal angle; palpus whitish; faint spot at furcation.



*Female*.—Length 12–15 mm. Eye bare, purple, with two green bands. Frons yellowish brown, grayer above, about four times as high as width at base, slightly widened above; basal callus shiny, chestnut brown, usually touching eyes and slightly higher than wide; median callus narrow, longer than basal callus and joined to it; subcallus yellowish. First antennal segment yellowish, moderately swollen above, with short black hair; second segment and basal portion of third orange, annulate portion black; basal portion moderately stout, with a distinct dorsal angle and shallow excision; annulate portion slightly longer than width of basal portion. Clypeus and genae gray, with concolorous hair. Second palpal segment creamy white, moderately stout at base, with short black hair.

Mesonotum dull brown, with an indication of paler lines in usual pattern. Pleura, sternum, and coxae gray, with concolorous hair. Wing hyaline, with a faint brownish spot at furcation; venation normal. Fore femur, apical half of fore tibia, and tarsi dark brown, with dark hair; legs otherwise yellowish, with pale hair, and with scattered black hair on middle and hind tibiae.

Dorsum of abdomen dull orange brown, with a median row of pale-grayish triangles which usually reach the length of the tergites, and oblique, sublateral spots touching hind margins of tergites. Venter grayish brown, with a broad, median, darker stripe.

*Male*.—Areas of large and small facets of eye sharply differentiated. Coloration essentially as in female, but femora darker.

*Type*.—Female, in the collection of C. B. Philip. Allotype male in the Ohio State Museum; paratypes in these collections and in the Canadian National Collection, the United States National Museum (No. 51965), the Rocky Mountain Spotted Fever Laboratory, Hamilton, Mont., the University of Kansas, the California Academy of Sciences, the Museum of Comparative Zoology, and the University of Texas.

*Type locality*.—Eastland County, Tex.

*Distribution*.—From Kansas to Texas and Arkansas. May 4 (Sonora, Tex.) to October 9 (Pearsall, Tex.). In the United States National Museum, 56 females, 7 males.

This is apparently one of the most troublesome species in the region where it occurs, and under the name of *Tabanus gracilis* Wiedemann it has been reported by Sanborn, Stiles, and Moe as a possible vector of anaplasmosis of cattle.

#### TABANUS TEXANUS Hine

(Fig. 24, A)

*Tabanus texanus* Hine, Ohio Nat. 8: 228, 1907; Philip, Ohio Jour. Sci. 36: 155, 1936.

Rather small; yellowish brown, with three rows of pale-yellowish triangles on abdomen, the median triangles, at least, contiguous; costal cell infuscated; coxae yellow; frons broad.

*Female*.—Length 10–14 mm. Eye bare, green, with a diagonal purple band from inner angle which does not reach outer margin. Frons yellowish gray, about two and two-thirds times as high as basal width, with nearly parallel sides; basal callus shiny black, slightly transverse and somewhat protuberant; median callus black, rather short and broad, rarely joined to basal callus; subcallus yellowish gray. First two antennal segments yellow, with black hair, the first not enlarged; basal portion of third yellow orange, sometimes with an indefinite, longitudinal, black stripe on middle of outer surface; dorsal angle prominent and dorsal excision moderate; annulate portion black, about as long as basal portion. Clypeus and genae nearly white, with white hair. Second palpal segment moderately stout at base, tapering to an acute apex, creamy white, with concolorous hair and often with many black hairs.

Mesoscutum and scutellum with dull greenish-yellow pollen and hair, the mesoscutum often with three darker longitudinal stripes; prescutal lobe tinged with orange. Pleura, sternum, and coxae yellowish gray, with pale hair. Wing hyaline, the costal cell yellow orange; venation normal. Femora yellowish

gray, the fore femur black on inner side; tibiae yellowish, the apical half of fore tibia and tips of others blackened; tarsi dark brown to black.

Abdomen above blackish brown, with three rows of yellowish-gray spots; median spots conspicuous, contiguous, and broadened abruptly at posterior margins, but usually narrowly separated from the conspicuous, oblique sublateral spots each of which reaches the length of the tergite; venter rather uniformly yellowish gray.

*Male*.—Areas of large and small facets of eye sharply differentiated, the latter occupying lower fourth and a very narrow margin around outside. Coloration essentially as in female.

Described from a specimen collected by J. M. Aldrich at Galveston, Tex., June 10, 1917.

*Type*.—Female, in the collection of Ohio State University.

*Type locality*.—Galveston, Tex.

*Distribution*.—Coastal region of Texas. May 31 (Humble) to September 19 (Brownsville). In the United States National Museum, five females, one male.



FIGURE 24.—Antenna, front view of head, and palpus of (A) *Tabanus texanus* and (B) *T. longiusculus*.

#### TABANUS LONGIUSCULUS Hine

(Fig. 24, B)

*Tabanus longiusculus* Hine, Ohio Nat. 8: 226, 1907; Philip, Ohio Jour. Sci. 36: 151–152, 1936.

Small; dark brownish, the abdomen with a narrow, median, gray stripe widened at posterior margins of tergites, and isolated sublateral spots; costal cell considerably yellowed; annulate portion of third antennal segment black; mesonotum dark, with rather distinct pollinose lines; frons parallel sided.

*Female*.—Length 11–13 mm. Eye bare, green, with two diagonal purple stripes and a triangular purple spot above, the base of latter on frons. Frons yellowish tinged with orange at vertex and at level of median callus, four to four and one-half times as high as width across basal callus, slightly widened above; basal callus orange brown, vertical and nearly touching eyes; median callus usually slightly darker, about half width of frons and usually joined to basal callus by a line; subcallus and upper genae concolorous with frons. First two antennal segments yellowish brown, with black hair; third orange, the annulate portion black, the basal portion rather stout, the dorsal angle prominent but not acute, the dorsal excision slight; annulate portion stout, slightly shorter than basal portion. Clypeus and lower genae pale gray, with white hair. Second palpal segment cream colored, with black and white hair, rather stout at base, but tapering to a slender apex.

Mesonotum blackish, the prescutal lobe and the stripes in usual pattern brownish. Pleura, sternum, and coxae gray, with white hair. Wing hyaline, the costal cell rather intensely yellow; venation normal. Legs generally yellowish brown, the fore femur, apices of tibiae, and the tarsi usually darker brown.

Abdomen above dark brown, somewhat lighter laterally, with light-brownish-gray markings consisting of a slender median line widening at the posterior margin of each tergite to form a narrow border, and round, isolated, sublateral spots on tergites 1–5 or 1–6, only the spot on tergite 1 touching the hind margin; venter reddish brown, blackened apically.

*Male*.—Eye with areas of large and small facets moderately well differentiated, the former covering slightly more than half the eye; second palpal seg-

ment pale cream colored, about twice as long as thick, the apex turned downward. Body coloration essentially as in female, although not quite so dark.

*Cotypes*.—A number of females in the collection of Ohio State University. Several females in the collection of the University of Kansas and in the United States National Museum are probably cotypes.

*Cotype localities*.—Southern Pines, N. C., and Mimsville, Ga.

*Distribution*.—North Carolina to Florida. May 9 (Mimsville, Ga.) to June 30 (Monticello, Fla.).

**TABANUS SACKENI Fairchild**

(Fig. 25, A)

*Tabanus sackeni* Fairchild, Boston Soc. Nat. Hist. Occas. Papers 8: 141-143, 1934; Philip, Ohio Jour. Sci. 36: 149-150, 1936.

Rather small; brown, with a faint median abdominal stripe and round sublateral spots not touching hind margins of tergites; wing hyaline; frons narrow and widened above; third antennal segment elongate.

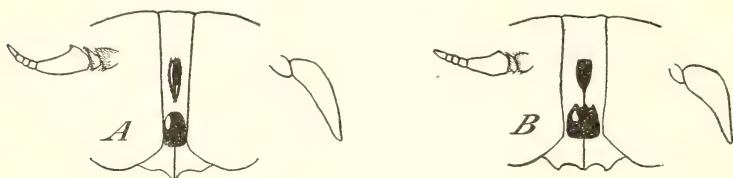


FIGURE 25.—Antenna, front view of head, and palpus of (A) *Tabanus sackeni* and (B) *T. sagax*.

*Female*.—Length 12-15 mm. Eye bare, purple, with three green bands, the upper one short. Frons yellowish, with black hair and some yellow hair just above basal callus, five to five and one-half times as high as width at base, distinctly widened above; basal callus black or chestnut brown, an oblong, higher than wide and touching eyes; median callus an irregular, elongate spot usually separated from basal callus; subcallus brownish yellow. First two antennal segments yellowish brown, with black hair, the first not swollen above; third deep orange brown, the annulate portion black; basal portion about one and three-fourths times as long as greatest width, the dorsal angle acute but short; annulate portion considerably shorter than basal portion. Top of genae concolorous with subcallus, the remainder of the genae and the clypeus light gray, with white hair. Second palpal segment white, with black hair, moderately swollen at base but tapering apically.

Mesonotum brown, with grayish-yellow hair, the dorsal stripes only faintly indicated; prescutal lobe slightly paler, with black hair. Pleura, sternum, and coxae gray, with white hair. Wing, including costal cell, hyaline; venation normal. Legs yellowish brown, the apical third of fore tibia and the tarsi, except basal half of first hind tarsal segment, blackened; hair of legs mostly white on pale portions except on hind tibia.

Abdomen above brown, slightly darkened apically, with a median row of rather faint, narrow, grayish, contiguous triangles expanding at posterior margins and sublateral, oblique, oval, yellowish spots usually completely surrounded by the brown ground color; venter gray.

*Male*.—Areas of large and small facets of eye sharply differentiated, the former extensive and the latter scarcely extending to vertex along hind margin. Second palpal segment pale cream colored, blunt at apex, with mostly white hair. Coloration of body essentially as in female.

*Type*.—A female. Paratypes, 13 specimens in the Museum of Comparative Zoology (No. 19527) and in the United States National Museum (No. 51976).

*Type locality*.—Cumberland Gap, Ky.



*Distribution*.—Oklahoma to Massachusetts and Virginia. July 15 (Adair County, Okla.) to September 3 (Big Bald Mountain, Va.). In the United States National Museum, 23 females, 4 males.

**TABANUS SAGAX** Osten Sacken

(Fig. 25, B)

*Tabanus sagax* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 452-453, 1876; Hine, Ohio Nat. 7: 26, 1906; La. Agr. Expt. Sta. Bull. 93: 56, 1907; Ohio Nat. 14: 226, 1914; Fairchild, Boston Soc. Nat. Hist. Occas. Papers 8: 141, 1934; Philip, Ohio Jour. Sci. 36: 151, 1936.

*Atylotus baal* Townsend, Amer. Ent. Soc. Trans. 22: 58-59, 1895.

*Tabanus dawsoni* Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 105, 1931.

Rather small; yellowish brown, the abdomen with a rather broad yellowish stripe widening at posterior margin of each tergite and rather faint sublateral spots; frons rather broad and parallel sided; third antennal segment with a rather elongate, orange, basal portion and black annulate portion; second palpal segment distinctly swollen basally.

*Female*.—Length 12-17 mm. Eye bare, green, with three narrow, diagonal, purple bands, the upper one not very curved. Frons yellow, about three times as high as basal width, with nearly parallel sides; basal callus dark brown, subquadrate, and nearly touching eyes; median callus a rather short, wide oblong, narrowly joined to basal callus; a few black hairs at vertex but no denuded area; subcallus pale yellow, the color extending on to upper genae. First two antennal segments yellow, with black hair; basal portion of third orange, contrasting with the entirely black annulate portion; basal portion rather long and slender, with low dorsal angle and shallow excision; annulate portion stout but pointed, slightly shorter than basal portion. Clypeus and lower genae white, with yellowish-white hair. Second palpal segment rather short, swollen at base, cream colored, with a mixture of black and cream-colored hair.

Mesonotum yellowish gray, with two faint yellowish lines anteriorly and with yellowish prescutal lobe. Pleura and sternum gray, with yellowish-white hair. Wing hyaline, the costal cell pale yellow; veins yellowish brown, the venation normal. Legs yellowish brown, the middle and hind coxae grayish, base of fore femur, fore tibia apically, and fore tarsus beyond first segment dark brown.

Dorsum of abdomen orange brown, darker on last three segments, with a median pale-yellowish stripe which widens slightly at posterior margin of each tergite; a blackish spot on middle of first tergite and usually another on middle of second tergite anteriorly; sublaterally a row of faint yellowish-orange spots, each usually separated from fore and hind margin of tergite; venter yellowish brown, slightly darker posteriorly, with pale-yellowish hair.

*Male*.—Areas of large and small facets of eye sharply differentiated, the area of small facets not or scarcely reaching vertex along outer margin. Second palpal segment cream colored, with black hair, the apex acute. Coloration essentially as in female, the dorsal abdominal stripe broad. (The male of this species very closely resembles *Tabanus sublongus* but the median stripe is wider.)

*Type*.—A lectotype labelled and herein designated, one of three cotype females, Museum of Comparative Zoology No. 4046.

*Type locality*.—Illinois? No locality data on pin.

*Distribution*.—Minnesota to Louisiana and Massachusetts. June 27 (Carlisle, Pa.) to August 3 (Woodbury, Conn.). In the United States National Museum, four females.

The type of *Atylotus baal* has been studied both by the writer and by Philip. Originally it was the writer's opinion that this was the same as what is herein described as *Tabanus sublongus*, but a cleaning of the type specimen of *baal* by Philip revealed it as *T. sagax* without any doubt; the specimens which the writer has determined as *Tabanus baal* are really *sublongus*.

## TABANUS SUBLONGUS, new species

(Fig. 26, A)

*Tabanus* "sp." Philip, Ohio Jour. Sci. 36: 156, 1936.

Rather small; orange brown, the abdomen with three rows of pale spots, the median spots slender, triangular, and the sublateral spots rather large and round; third antennal segment long, slender, bicolored; frons of medium width, with nearly parallel sides; basal callus nearly black; median callus detached.

*Female*.—Length 12–14 mm. Eye bare, green, with a narrow, diagonal, purple band, a large purple triangle above, and a fainter band below. Frons yellow orange, three and one-half to four and one-half times as high as wide, with nearly parallel sides; basal callus shiny dark brown to black, as wide or nearly as wide as frons, square or slightly higher than wide; median callus black, only



FIGURE 26.—Antenna, front view of head, and palpus of (A) *Tabanus sublongus* and (B) *T. longus*.

rarely attached to basal callus by a slender line; subcallus and upper genae yellowish orange. Antenna mostly orange; first two segments with a yellowish tinge and black hair; annulate portion of third black; third with basal portion long and slender, the dorsal angle very short but sometimes acute, the dorsal excision very shallow; annulate portion about two-thirds as long as basal portion. Clypeus and lower genae pale gray, with gray hair. Second palpal segment moderately stout at base but strongly tapering, nearly as long as proboscis, cream colored, with short black hair.

Mesonotum black, with brown hair and some brownish pollen, with scarcely any stripes; prescutal lobe orange brown. Pleura, sternum, and coxae pale gray, with white hair. Wing nearly hyaline, the costal cell only faintly washed with orange; veins orange brown, the venation normal. Legs nearly uniformly yellowish brown, the fore tibia at apex and all tarsi slightly darker.

Abdomen above dark brown, with three rows of yellowish-brown spots; the median spots forming a continuous slender line, widening abruptly at posterior margin of each tergite; sublateral spots rather large, oblique and each in contact with hind margin of tergite; venter orange brown, sometimes clouded with darker color.

*Male*.—Areas of large and small facets of eye distinctly differentiated. Color of whole body essentially as in female, the black on abdomen more restricted.

*Type*.—A female, United States National Museum No. 51966. Paratypes, nine females, one male, United States National Museum No. 51966. Other paratypes are in the Museum of Comparative Zoology, the collection of the University of Kansas, and the collection of C. B. Philip.

*Type locality*.—Plummers Island, Md.

*Distribution*.—Maryland, Virginia, New York, Pennsylvania, Tennessee, Missouri, Arkansas, Kansas, and Oklahoma. The type was collected August 5, 1917, by G. M. Greene. Others from June (Ithaca, N. Y.) to September 14 (Cabin John Bridge, Md.).

## TABANUS LONGUS Osten Sacken

(Fig. 26, B)

*Tabanus longus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4, and sup.) : 447-448, 559, 1876-78; Hine, Ohio Nat. 14: 227-228, 1914; Fairchild, Boston Soc. Nat. Hist. Occas. Papers 8: 140, 1934; Philip, Ohio Jour. Sci. 36: 149, 1936.

Rather small; brownish, the abdomen with three rows of small grayish spots, the sublateral spots not touching hind margins of tergites; frons parallel sided; third antennal segment rather slender, with basal portion orange, annulate portion black.

*Female*.—Length 13-15 mm. Eye bare. Frons yellowish brown, about three and one-half times as high as wide, with nearly parallel sides; basal callus subquadrate, yellowish to dark brown; median callus small, narrowly joined to basal callus; subcallus and upper genae concolorous with frons. Antenna mostly orange, the first two segments with black hair, the first not enlarged; third slender, the dorsal angle obtuse and rounded and excision shallow; annulate portion black in contrast to basal portion. Clypeus and lower genae light gray, with white hair. Palpus short, moderate in thickness, and only slightly tapered, with a mixture of black and white hair.

Mesonotum dark brown, with a mixture of black and white hair; prescutal lobe yellowish brown, with black hair. Pleura, sternum, and coxae gray, with white hair. Wing hyaline; venation normal. Legs yellowish brown, the fore tibia and all tarsi somewhat darkened.

Abdomen dark brown above, with a median row of slender, evanescent, whitish spots widened at posterior margins, and sublateral, oblique spots of same color not touching posterior margins; venter grayish brown.

*Male*.—Unknown.

*Type*.—One of the two cotype females, Museum of Comparative Zoology No. 4043, labelled and herein designated as lectotype.

*Type locality*.—Middle Atlantic States.

*Distribution*.—Pennsylvania and North Carolina to Oklahoma. August 19 (Plummers Island, Md.) to October 9 (Yell County, Ark.). In the United States National Museum, three females.

This species is apparently an uncommon one, many of the specimens determined as *longus* at various times being *sackeni* or *sublongus*. I have not seen enough specimens of *longus* to feel sure of its limits; and it is possible that, as Philip has pointed out in connection with the Arkansas specimens, there may be more species still to be recognized in the *longus* group.

## TABANUS PUMILUS Macquart

(Fig. 27, A)

*Tabanus pumilus* Macquart, Diptères exotiques nouveaux ou peu connus, v. 1, pt. 1, pp. 146-147, 1838; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4) : 448, 1876; Hine, Ohio State Acad. Sci. Spec. Papers 5: 53, 1903; La. Agr. Expt. Sta. Bull. 93: 54-55, 1907.

Small; blackish, with a row of narrow, pale, median triangles on abdomen and small, round, sublateral spots; median callus nearly square; third antennal segment with a distinct dorsal angle; second palpal segment not strongly swollen basally and not tapering to a sharp apex.

*Female*.—Length 9-11 mm. Eye bare, deep purple, with two rather broad green-blue bands. Frons gray tinged with yellow, four and one-half to five times as high as width at basal callus, the width at basal callus six-tenths of width at vertex; basal callus shiny black, square or slightly higher than wide, and either separated from median callus or joined to it by a narrow black line; median callus as large as or larger than basal callus, shiny black, but with a roughened surface; vertex usually with a flat, black, denuded spot about one-third width of vertex and slightly higher than wide; subcallus and upper genae yellow brown. Antenna orange, the annulate portion sometimes darker: first two segments with black hair; basal portion of third broad and



stout, only slightly longer than broad and little, if at all, excised beyond dorsal angle; annulate portion shorter than width of basal portion. Clypeus and lower genae light gray, with white hair. Palpus creamy white, with white and black hair, the second segment moderate in width, tapering, but the apex rather rounded.

Mesonotum brownish black, with gray longitudinal stripes in usual pattern. Humeral and prescutal lobes yellowish orange. Pleura, sternum, and coxae gray tinged with yellowish, with white hair. Wing hyaline; vein R, sometimes with short stump. Legs orange brown, the femora sometimes distinctly grayish; fore tibia with apical half blackish; middle and hind tibiae with apices usually darker; fore tarsus darker than others.

Abdomen brownish black, with cream-colored markings consisting of very narrow posterior margins to tergites, a faint median row of triangles, and sublateral rows of round spots completely surrounded by the dark-brown color; venter gray tinged with reddish.

*Male*.—Areas of large and small facets of eye sharply differentiated, the former extensive. Body coloration essentially as in female.



FIGURE 27.—Antenna, front view of head, and palpus of (A) *Tabanus pumilus*, (B) *T. fratellus*, and (C) *T. sparus*.

The writer has been unable to distinguish surely the male of this species from that of *Tabanus sparus*, although fresh specimens should show a difference in eye pattern. The frontal and palpal characters of the female, which separate the two species, are lacking in this sex.

*Type*.—Female, collection unknown.

*Type locality*.—"Carolina."

*Distribution*.—Central New York and Maine to Florida and west to Arkansas. March 26 (Silver Springs, Fla.) to August 18 (Lyme, Conn.). In the United States National Museum, 64 females.

#### TABANUS FRATELLUS Williston

(Fig. 27, B)

*Tabanus fratellus* Williston, Kans. Acad. Sci. Trans. 10: 140, 1887; Hine, Ohio Nat. 5: 237, 1904; Philip, Bull. Brooklyn Ent. Soc. 31: 192, 1936.

*Diachlorus haematopotides* Bigot, Mem. Soc. Zool. France 5: 624-625, 1892.

Small; black, with three rows of small gray spots on abdomen, the median row often indistinct; third antennal segment with scarcely any dorsal angle.

*Female*.—Length 10-11 mm. Eye bare, purplish, with four green-blue, diagonal bands. Frons gray, three and one-half to four times as high as width at base, somewhat widened above; basal callus shiny brownish black, nearly square, and not quite touching eyes; median callus of same color, not quite so shiny, nearly as large as basal callus and connected with it at most by a narrow line; vertex often somewhat denuded, black; subcallus gray, the supra-antennal crescents unusually wide, yellowish. Antenna reddish brown, the first two segments and annulate portion of third usually darker; basal portion of third segment with a very low, obtuse, dorsal angle, its greatest width about five-eighths of its length; annulate portion about as long as width of basal portion. Clypeus, genae, and subcallus whitish, with concolorous hair. Second palpal segment rather slender throughout, pale yellowish, with black and white hair.

Mesonotum, including prescutal lobe, black, with gray lines in usual pattern; rest of thorax and coxae grayish, with white hair. Wing hyaline, with dark-brown veins, the venation normal. Legs blackish, the basal half of fore tibia and all but apices of others yellowish brown.

Abdomen black, with three rows of gray spots and each segment with a narrow posterior band; median spots small, occasionally joined to form a

continuous row; sublateral spots oblique, rarely touching hind margins of tergites; venter blackish, with narrow gray bands.

*Male*.—Eye bare, the areas of large and small facets distinctly differentiated. Second palpal segment with apex acute and slightly decurved. Body coloration as in female.

Described from a specimen collected by J. M. Aldrich on Mount Constitution, Wash., July 17, 1909.

*Type*.—Originally there were two cotype females, but one of these, now in the collection of the University of Kansas and labelled "W. T.", is herein designated as lectotype.

*Type locality*.—Washington.

*Distribution*.—Yukon Territory to Washington and Idaho. July 5 (Lillooet, British Columbia) to August 13 (Terrace, British Columbia). In the United States National Museum, 13 females, 1 male.

This species is remarkably like *Tabanus hirsutus* Villers of the mountains of central Europe, and it may be that they are the same in spite of the broad gap in distribution, which may be due to insufficient collecting in the mountains of Asia. Hine studied the type of *Diachlorus haematopotides* Bigot and confirmed Ricardo's statement concerning the synonymy. The writer has examined the type of *T. fratellus*.

#### TABANUS SPARUS Whitney

(Fig. 27, C)

*Tabanus sparus* Whitney, Canad. Ent. 11: 38, 1879; Williston, Kans. Acad. Sci. Trans. 10: 140, 1887; Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8: 86-87, 1933; Philip, Bull. Brooklyn Ent. Soc. 31: 194-195, 1936.

Small; brownish black, with three rows of gray spots on abdomen; frons rather narrow, widened above; median callus a slender line; second palpal segment swollen basally, but tapering to a sharp apex.

*Female*.—Length 9-11 mm. Eye bare, green, with a purplish reflection and, in specimens from southern portion of range, with a narrow, diagonal, purple band (see subspecies *milleri*). Frons brownish gray, five times as high as width across basal callus, widened above; basal callus dark brown, small, square or slightly higher than wide, touching neither eyes nor line between frons and subcallus; median callus a slender black line or elongate spot, usually longer than basal callus; vertex usually completely pollinose; subcallus and upper genae brown. Antenna orange brown, the first two segments with black hair; basal portion of third rather short and stout, with a distinct dorsal angle but no excision; annulate portion stout, about equal in length to width of basal portion. Clypeus and lower genae grayish white, with white hair. Second palpal segment creamy white, with concolorous hairs and a few black ones, stout at base and tapering to a sharp point.

Mesonotum blackish, with faint stripes in usual pattern and a mixture of black and orange hair; prescutal lobe yellowish brown. Pleura, sternum, and coxae gray, with whitish hair. Wing hyaline, venation normal. Femora gray tinged with reddish brown; tibiae yellowish brown, the apical half of fore tibia and extreme apices of others darkened; tarsi dark brownish black.

Abdomen dark brownish black, with light-yellowish-gray median triangles and a sublateral row of small spots of same color; sublateral spots on tergites 2 and 3 usually, but not always, touching hind margin more or less broadly; a narrow posterior border of gray pollen on all tergites; venter gray, with paler incisures.

*Male*.—Not positively identified. See *T. pumilus*, p. 76.

*Type*.—A lectotype female, labelled and herein designated, one of two cotype females in the Museum of Comparative Zoology (No. 4039). A third cotype is in the collection of the Boston Society of Natural History.

*Type locality*.—Milford, N. H.

*Distribution* (including subspecies *milleri*).—Kansas to New Hampshire and Florida. May 9 (Paradise Key, Fla.) to September 8 (Pineland, Fla.). In the United States National Museum, 146 females.

**TABANUS SPARUS subspecies MILLERI Whitney**

*Tabanus milleri* Whitney, Canad. Ent. 46: 344, 1914; Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8: 86, 1933.

The description of *milleri* was based upon specimens collected in Florida and differing from the typical *sparus* only in the presence, in fresh or relaxed specimens, of a rather broad, diagonal, purple band on the dark-greenish eye. Although originally described as a species, the writer does not believe it to be more than a subspecies occupying the southern portion of the species' range and mingling with the typical *sparus* in New Jersey. It cannot be recognized in dry specimens.

*Cotype*.—Female, probably no longer in existence.

*Type locality*.—Florida.

**TABANUS VENUSTUS Osten Sacken**

(Fig. 28, A)

*Tabanus venustus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 444-445, 1876; Hine, Ohio State Acad. Sci. Spec. Papers 5: 56, 1903; Ohio Nat. 5: 244, 1904; La. Agr. Expt. Sta. Bull. 93: 58-59, 1907; Jones and Bradley, Jour. Econ. Ent. 17: 48-49, 1924; Schwardt, Ark. Agr. Expt. Sta. Bull. 332: 57, 1936.

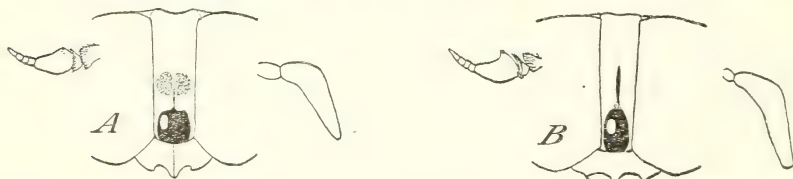


FIGURE 28.—Antenna, front view of head, and palpus of (A) *Tabanus venustus* and (B) *T. johnsoni*.

Medium sized; wing variegated; abdomen with a median row of white triangles.

*Female*.—Length 16-18 mm. Eye bare, purple, with two narrow green bands; in dried specimens the dark band between the two green bands usually visible. Frons brownish gray, about three times as high as width at base, slightly widened to median callus; basal callus brown to nearly black, rounded, slightly higher than wide, not touching eyes; median callus spindle shaped, small, orange brown, usually separated from basal callus and set in a dark-brown or black pollinose area nearly as wide as frons; subcallus yellowish brown, the clypeus and genae grayer; hair of clypeus and genae sparse, brownish. Antenna brown, the extreme base of third segment somewhat paler; first and second with short black hair; third rather short and broad, with only a very slight excision beyond the moderate dorsal angle; annulate portion but slightly shorter than basal portion, the annuli distinct. Second palpal segment brown, with short black and yellowish hair, rather slender and elongate.

Mesoscutum with gray pollen and pile and longitudinal stripes of brown pollen; scutellum grayish; prescutal lobe with coarse black hair on lower margin. Pleura and sternum generally brown. Wing nearly hyaline, with dark-brownish infuscation as follows: Costal cell beyond humeral cross vein, band across cells R and M nearly to hind margin of wing, conspicuous spots on all cross veins and on furcation, a broad spot bordering middle of vein  $R_2$ , and entire margin of wing, with a concentration and widening at each vein ending;



vein  $R_4$  without a stump vein; cell  $R_5$  somewhat narrowed at margin. Legs generally brown or blackish, the tibiae paler; hind tibial fringe dark, distinct.

Abdomen above dark brown to black; first tergite with a small, median, white spot; tergites 2-6 with median white triangles, widest on third tergite, smaller posteriorly; sublateral row of rather faint, round, pale spots on tergites 3-6; venter brownish gray, with whitish incisures and usually with a broad, darker-brown, median stripe.

*Male*.—Facets of upper two-thirds of eye scarcely larger than those of lower third, the line of differentiation not marked; a dark diagonal stripe present. Lower clypeus and genae with dark-brown pollen and pile. Palpus, thorax, and legs nearly black. Pale stripes of mesoscutum confined to anterior margin; scutellum and a distinct spot on postalar lobe with white pollen and pile. First tergite black, second with a narrow, posterior, pale band nearly uniform in width, third and fourth mostly white, with four dark spots joined together along anterior margin, fifth with three pale spots, sixth usually with some pale markings; venter dark brown, with a row of pale spots on each side of the broad, median, dark stripe.

*Type*.—The female herein designated as lectotype from a cotype pair in the Museum of Comparative Zoology (No. 4038).

*Type locality*.—Dallas, Tex.

*Distribution*.—From Iowa to Ohio and south to Texas and Louisiana. May 19 (Victoria, Tex.) to September 1 (Opelousas, La.). In the United States National Museum, 22 females, 2 males.

#### TABANUS JOHNSONI Hine

(Fig. 28, B)

*Tabanus johnsoni* Hine, Ohio Nat. 8: 225, 1907.

Medium sized; orange brown, the abdomen with a median row of contiguous yellowish-brown triangles and very faint sublateral spots; wing orange brown, spotted with brownish.

*Female*.—Length 16-20 mm. Eye bare. Head yellowish brown, paler below. Frons a little over four times as high as width across basal callus, slightly widened above; basal callus higher than wide, nearly touching eyes, orange brown; median callus a slender brown streak very narrowly joined to the basal callus. Antenna uniformly yellow brown, the first two segments with black hair; third with a prominent, slightly acute, dorsal angle, the dorsal excision very strong; annulate portion slightly shorter than basal portion. Hair of head and most of body yellow. Second palpal segment of moderate length and thickness, with short black hair.

Thorax yellow brown, slightly darker above, with indications of faint longitudinal lines; some black hair on prescutal lobes; wing tinged with yellow brown, with costal cell stronger yellow and with distinct brown spots at furcation and cross veins. Legs rather uniformly yellowish brown, with concolorous hair.

Abdomen somewhat orange brown, with darker markings above, which set off three rows of paler spots; the median row of triangles forming a continuous stripe, widening at each segment posteriorly; sublateral spots less distinct; venter orange brown tinged with black.

*Male*.—Unknown.

*Cotypes*.—In the collection of Ohio State University and in the Museum of Comparative Zoology.

*Type locality*.—St. Augustine, Fla.

*Distribution*.—Eastern Florida from St. Augustine to Homestead and Paradise Key. May 17 (Zellwood) to September 8 (Homestead). In the United States National Museum, 19 females.

This is very close to *acutus* (Bigot), but in *acutus* the median abdominal stripe is parallel sided, the abdomen is slightly more slender, the palpus is slightly longer, and the dorsal angle of the third antennal segment projects forward slightly.

## TABANUS BIRDIEI Whitney

(Fig. 29, A)

*Tabanus birdiei* Whitney, Canad. Ent. 46: 343-344, 1914; Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8: 86, 1933.

Medium sized; reddish brown, with three rows of pale spots on abdomen, confluent along posterior margins of tergites; wing spotted; frons broad; basal callus prominent, subquadrate.

*Female*.—Length 14-17 mm. Eye bare, purple, with two green bands. Frons gray, two and one-half to three times as high as wide, with parallel sides; basal callus protuberant, shiny, reddish brown, subquadrate, rounded above; median callus a short, triangular, flat, rather dull reddish-brown extension from top of basal callus. Subcallus, clypeus, and genae light gray, with white

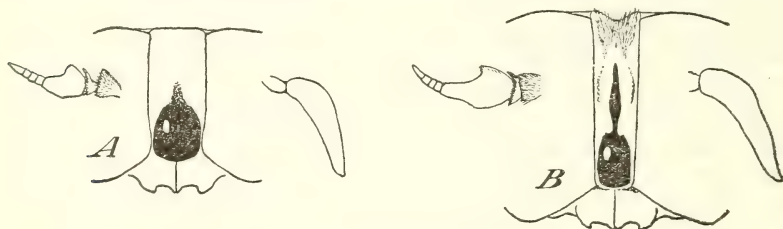


FIGURE 29.—Antenna, front view of head, and palpus of (A) *Tabanus birdiei* and (B) *T. cymatophorus*.

hair below. Antenna reddish, darkened beyond dorsal angle of third segment; first and second segments with black hair; third with basal portion only slightly longer than broad, dorsal angle rectangular and excision pronounced; annulate portion about as long as basal portion. Second palpal segment rather slender, light reddish brown, with a mixture of black and white hair.

Mesonotum reddish brown, with gray lines in usual pattern and a mixture of white, yellowish, and black hair, the latter abundant on prescutal lobe. Pleura, sternum, and coxae gray tinged with reddish, with white hair. Wing hyaline, with pronounced brown spots at furcation and cross veins; cell *R*<sub>5</sub> somewhat narrowed apically. Legs reddish brown, with mostly white hair, the apical half of fore tibia and apical fourths of other tibiae and all tarsi with black hair; hind tibial fringe distinct, the hairs toward base white, toward apex black.

Abdomen above rather pale reddish brown, with broad, whitish, posterior margins which expand into distinct gray triangles medianly and less distinct ones sublaterally, none reaching anterior margin; venter nearly uniformly gray.

*Male*.—Unknown.

*Cotypes*.—Eight, all bearing same data and almost identical, Museum of Comparative Zoology No. 17059.

*Type locality*.—West Palm Beach, Fla.

*Distribution*.—Gotha to West Palm Beach, Fla. March (Gotha) to April 30 (St. Petersburg). In the United States National Museum, two females.

## TABANUS CYMATOPHORUS Osten Sacken

(Fig. 29, B)

*Tabanus cymatophorus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 444, 1876; Hine, La. Agr. Expt. Sta. Bull. 93: 47-48, 1907; Schwardt, Ark. Agr. Expt. Sta. Bull. 332: 38, 1936; Philip, Bull. Brooklyn Ent. Soc. 31: 190, 1936.

Rather large; gray and brownish, with three rows of white spots on abdomen, which are confluent along hind margins; furcation and cross veins of wing margined with brown; frons rather narrow; basal callus higher than wide.

*Female*.—Length 18–21 mm. Eye bare, deep purple, with two green bands. Frons about four and one-half times as high as width at base, somewhat widened above, yellowish, the vertex gray, with black hair; basal callus brown, distinctly higher than wide, not touching eyes; median callus lanceolate, concolorous with, narrowly joined to, and slightly longer than, basal callus; subcallus pale yellow, only slightly convex. Antenna orange brown, somewhat darker apically; first two segments with black hair, the second with a strong dorsal process; basal portion of third rather elongate, the dorsal angle prominent, rectangular, the dorsal excision strong and also about rectangular; annulate portion about equal in length to width of basal portion at its widest point. Clypeus and genae nearly white or yellowish white, with concolorous pile. Second palpal segment rather slender, moderate in length, with white and black hair.

Mesoscutum with gray or yellowish pollen and pile, with four broad longitudinal stripes of dark-brown pollen and hair; a fringe of black hair on lower margin of prescutal lobe; heavy tufts of pale hair above and below wing base; a small dark triangle just before scutellum, which is entirely pale. Wing dilute brown, nearly hyaline, with dark clouds at furcation and cross veins; costal cell not noticeably darkened; cell  $R_5$  strongly narrowed apically or closed. Femora dark brown, with long pale hair; tibiae pale yellow, with white hair, except apical half of fore tibia and apical fourth of middle and hind tibiae, which are dark brown to black, with black hair; hind tibial fringe prominent, yellowish white basally, black apically; tarsi nearly black.

Abdomen above mostly gray; first segment with indefinite dark markings laterally, but with a distinct pale spot just behind apex of scutellum; on each of tergites 2–6 are four dark spots which may be joined along anterior margin and which are usually completely separated from hind margin; on tergites 2–3 the median dark spots are always joined anteriorly, and these inverted V's may reach the posterior margin; the lateral spots are shorter than the median spots, never touch the posterior margin, and only narrowly touch the lateral margin; venter with lateral thirds and a narrow hind margin on each sternite gray, the middle dark reddish brown.

*Male*.—Areas of large and small facets of eye sharply differentiated, the small facets extending around upper margin of eye to vertex. Second palpal segment cream colored, with a tuft of black hair at apex. Coloration essentially as in female.

Described from two specimens reared from larvae in Arkansas by H. H. Schwardt.

*Type*.—Female, Museum of Comparative Zoology No. 4037.

*Type locality*.—Near Mammoth Cave, Ky.

*Distribution*.—Maryland to Texas. June 5 (Beaumont, Tex.) to October 5 (Crowley, La.). In the United States National Museum, 14 females, 2 males.

#### TABANUS MONOENSIS Hine

(Fig. 30, A)

*Tabanus monoensis* Hine, in Webb and Wells, U. S. Dept. Agr., Dept. Bull. 1218: 29–31, 1924.

Rather small; grayish; vertex with a subquadrate denuded spot; eye bare; furcation and basal section of vein  $M_2$  margined with brown.

*Female*.—Length 12–14 mm. Eye bare. Frons gray tinged with yellow, about three and one-half times as high as width at base, widened above; basal callus shiny dark brown, subquadrate, touching eyes; median callus rather small, slender, tapering at both ends and usually narrowly joined to basal callus; a brownish-black denuded spot at vertex, scarcely raised, not touching eyes and narrowed anteriorly; subcallus yellowish brown, denuded or very thinly covered with grayish-brown pollen. Antenna orange brown, the first two segments and annulate portion of third slightly darkened; first segment not swollen above, with black hair above and white below; second with a distinct dorsal process; third with a short but distinct dorsal angle and shallow excision, the basal portion about two-thirds as wide as long and annulate portion not quite as long as basal portion. Clypeus and genae gray, with white hair, some black hair admixed above. Second palpal segment



stout at base, not long, but tapering to a narrow apex, creamy white, with concolorous and black hair.

Mesonotum blackish, with narrow gray stripes in usual pattern and orange-brown prescutal lobe. Pleura, sternum, and coxae gray, with white hair. Wing hyaline, the stigma, a spot at furcation, and margin of basal portion of vein  $M_2$  brown; venation normal. Femora grayish, with mostly pale hair; fore tibia with basal half pale yellowish, with concolorous hair, the apex dark brown, with black hair; middle and hind tibiae orange brown, somewhat paler basally; tarsi orange brown, the fore tarsus darkest.

Abdomen above blackish, with a median row of gray triangles, narrowly contiguous, and oblique sublateral spots touching hind margins of tergites and often tinged with brown; venter gray tinged with reddish.

*Male*.—Areas of large and small facets of eye sharply differentiated, the former yellowish, with a dark-brown transverse band; second palpal segment stout, rounded apically, with heavy white hair. Prescutal lobe nearly black. Rest of coloration essentially as in female.

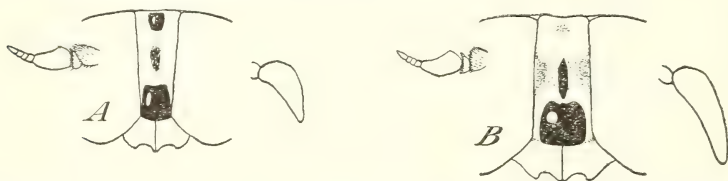


FIGURE 30.—Antenna, front view of head, and palpus of (A) *Tabanus monoensis* and (B) *T. reinwardtii*.

*Type*.—A female, United States National Museum No. 24950. Allotype and paratype, United States National Museum No. 24950.

*Type locality*.—Topaz, Mono County, Calif.

*Distribution*.—California from Los Angeles County to Mono County. June 31 to August 3 (Topaz, Calif.). In the United States National Museum, five females, one male.

#### TABANUS REINWARDTII Wiedemann

(Fig. 30, B)

*Tabanus reinwardtii* Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, pp. 130–131, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 461–462, 1876; Hine, Ohio State Acad. Sci. Spec. Papers 5: 54, 1903; Jones and Bradley, Jour. Econ. Ent. 16: 310, 1923; Cameron, Bull. Ent. Research 17: 35–36, 1926; Stone, Ann. Ent. Soc. Amer. 23: 299–301, 1930; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 32, 114, 1931; Schwardt, Ark. Agr. Expt. Sta. Bull. 332: 48, 1936.

*Tabanus erythrotelus* Walker, Insecta Saundersiana, Diptera, v. 1, p. 25, pl. 2, fig. 1, 1850.

Medium sized; blackish, with three rows of gray spots on abdomen; furcation and cross veins margined with brown; frons rather broad, with a large, shiny, basal callus; vertex without a large denuded area.

*Female*.—Length 15–19 mm. Eye bare or with very sparse, short pile, purple, with two bluish-green diagonal bands. Frons about two and one-half times as high as width at base, parallel sided or slightly narrowed above, tinged with yellow and with a large reddish-brown to black spot at level of median callus; basal callus reddish brown to black, subquadrate, and not quite touching eyes; median callus slender, lanceolate, narrowly joined to basal callus; a small, denuded, wrinkled spot at lower margin of vertex, not raised to form a tubercle; subcallus yellowish gray. Antenna black, the first two segments and extreme base of third sometimes reddish brown; dorsal angle of third moderate and dorsal excision shallow; annulate portion usually slightly shorter than basal portion. Upper genae tinged with yellow, the lower genae and clypeus pale gray, with white hair. Second palpal segment moderately heavy, not elongate, usually tinged with reddish and with a mixture of short black and white hair.

Mesoscutum nearly black, with lines of reddish pollen and gray pile in usual pattern; scutellum sometimes margined with reddish; prescutal lobe, upper portion of pleura, and lateral portion of sternum reddish, the rest of pleura and sternum nearly black. Wing hyaline, the cross veins and furcation distinctly margined with brown; cell  $R_5$  somewhat narrowed apically. Legs reddish brown to black, the fore tibia pale on basal half, with white hair, black apically, the division distinct; middle and hind tibiae black apically; hind tibial fringe well developed, white, except at apex, where it is black.

Abdomen above black, tinged with reddish, with three rows of gray spots; median triangles rather narrow, extending whole length of segments; sublateral spots larger, oblique, touching hind margin on second and sometimes third segments, but not on others and not joined to median triangles along hind margin of segments; venter gray, somewhat darker medianly.

*Male*.—Eye densely pilose, the upper facets slightly larger than the lower ones, the line of differentiation not distinct. Hair of genae black, of pleura and sternum white, dense. Sublateral abdominal spots considerably larger than in female.

*Type*.—Female, collection unknown.

*Type locality*.—Pennsylvania.

*Distribution*.—Alberta to Nova Scotia and south to Colorado, Arkansas, and Georgia. June 4 (Atlanta, Ga.) to September 10 (Trenton, N. J.). In the United States National Museum, 20 females, 7 males.

The larvae of this species may usually be found in the muddy banks of almost any stream or pond, their abundance in any locality greatly exceeding the number of adults that can be found. Whether this is due to a high mortality for the immature stages or to secretive habits in the adults is not known.

#### TABANUS AMERICANUS Forster

(Fig. 31)

*Tabanus americanus* Forster, Novae Species Insectorum, centuria 1, p. 100, 1771; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 457–458, 1876; Hine, La. Agr. Expt. Sta. Bull. 93: 42–43, 1907; Snyder, Ent. Soc. Wash. Proc. 19: 141–145, 1917; Mosier and Snyder, Ent. Soc. Wash. Proc. 20: 115–126, 1918.

*Tabanus plumbeus* Drury, Illustrations of Natural History, v. 1, p. 103, pl. 44, fig. 2, 1773.

*Tabanus ruficornis* Fabricius, Systema Entomologiae, p. 789, 1775.

*Tabanus limbatus* Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, pp. 54–55, 1807.

*Stigmatophthalmus americanus* Enderlein, Mitt. Zool. Mus. Berlin 11: 387, 1925.

The largest Nearctic tabanid, brown, with wing hyaline and costal cell dark.

*Female*.—Length 25–30 mm. Eye bare, unicolorous, brilliant green. Whole head orange yellow. Height of frons about four times width at base, slightly narrowed above; basal callus orange brown or dark brown, narrower than frons, higher than wide, tapering to linear median callus above, which reaches to upper third of frons or beyond; vertex gray, with black hair and a dark, often shiny triangle. Pile of clypeus and genae bright yellowish orange. Antenna uniformly orange; first two segments with black hair; third slender, with a very prominent, forward-projecting, dorsal process; annulate portion slender, shorter than width of basal portion. Second palpal segment orange to brown, elongate, slender, compressed, with short black hair.

Mesonotum dark purplish or reddish brown, sometimes with faint lines of gray pollen. Pleura and sternum reddish brown, with orange or brownish pile, particularly a patch on epimera; tufts of yellowish-white pile above and below wing base and on postalar lobe. Wing hyaline, the costal cell and base strongly infuscated; cell  $R_5$  slightly narrowed apically. Legs orange brown, the tarsi darker; hind tibial fringe well developed, orange brown to nearly black.

Abdomen dark reddish brown to nearly black, often with a gray band on hind margin of each tergite and sternite, somewhat widened laterally.

*Male*.—Areas of large and small facets of eye distinctly differentiated, the small facets extending around margin of eye to vertex. Coloration of body very similar to that of female, but usually somewhat lighter in color than most females.

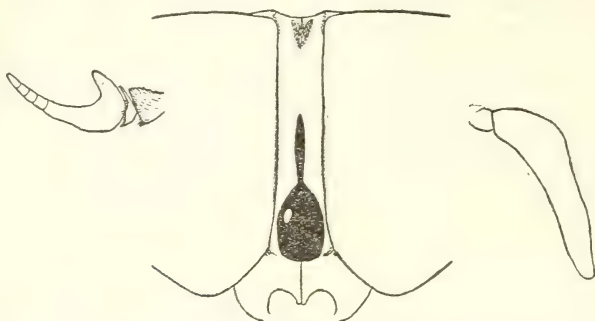


FIGURE 31.—Antenna, front view of head, and palpus of *Tabanus americanus*.

*Type*.—Female, collection unknown.

*Type locality*.—Virginia and “Provincia Noveboracensi, Americae Septentrionalis.”

*Distribution*.—Southeastern part of the United States from Massachusetts to Florida and west to Oklahoma and Texas; Bahamas. March 15 (Paradise Key, Fla.) to August 22 (Cohasset, Mass.). In the United States National Museum, 102 females, 51 males.

#### TABANUS GIGANTEUS Degeer

(Fig. 32)

*Tabanus giganteus* Degeer, Mémoires pour servir à l'histoire des insectes, v. 6, pp. 226–227, pl. 30, fig. 1, 1776; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 458–459, 1876; Hine, Ohio State Acad. Sci. Spec. Papers 5: 51, 1903.

*Tabanus lineatus* Fabricius, Species Insectorum, v. 2, pp. 455–456, 1781; Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, p. 115, 1828.

? *Tabanus pallidus* Palisot de Beauvois, Insectes recueillis en Afrique et en Amérique, pp. 100–101, pl. 2, fig. 3, 1809.

*Tabanus bicolor* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 2, pp. 37–38, 1847.

*Tabanus caesiofasciatus* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 5, pp. 52–53, 1855.

Large; thorax brownish and abdomen blackish; rarely faint median triangles on abdomen; palpus yellowish; wing uniformly dilute brown, with yellow-brown costal cell and without brown spot at furcation.

*Female*.—Length 22–25 mm. Eye bare, unicolorous. Frons about four and one-half times as high as width at base, with sides parallel or nearly so, yellowish brown, with short black hair; basal callus dark reddish, slightly narrower than frons, tapering into the slender median callus, which reaches over half way to the grayish vertex; subcallus pale yellow. Antenna orange brown; first segment somewhat expanded apically, with short black hair; third with a prominent dorsal angle, slightly projecting forward, and a deep dorsal excision; basal portion with a rather distinct angle midway of ventral margin; annulate portion slender, about equal in length to basal portion beyond dorsal angle, the annuli distinct. Clypeus and genae white, with pale-yellow hair. Second palpal segment yellowish brown, with short black hair, elongate and compressed, the tip rather square.



Mesoscutum dark brown, with short black hair, the indistinct reddish lines with yellowish-brown hair; scutellum black discally, reddish around margin; pleura gray, with white hair, the mesopleura with some black hair; patches of white hair above wing base. Wing pale brownish, the costal cell darker, yellow orange; cell  $R_5$  slightly narrowed apically. Legs generally reddish brown, the tarsi blacker; hind tibia darker, the fringe black.

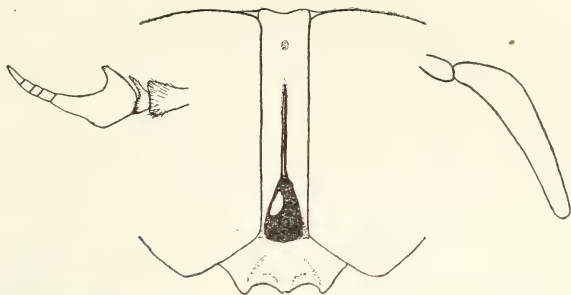


FIGURE 32.—Antenna, front view of head, and palpus of *Tabanus giganteus*.

Abdomen dark reddish brown to black, with thin gray pollen; a row of indistinct gray triangles in well preserved specimens; venter dark reddish to black, the tergites each with a narrow hind margin of white pollen laterally.

*Male*.—Eye bare, the facets minute, those above only slightly larger, the line of differentiation indistinct. Second palpal segment about twice as long as wide, oval, truncate at tip, with long black hair. The pale hair of body more yellowish than in female.

*Type*.—Female, collection unknown.

*Type locality*.—Pennsylvania.

*Distribution*.—United States from New York to Florida and west to Missouri and Oklahoma. July 20 (Beltsville, Md.) to October 8 (Ozark Beach, Mo.). In the United States National Museum, 33 females, 3 males.

The figure of *T. pallidus* Palisot bears a rather close resemblance to *giganteus* and it is probable that they are the same.

#### TABANUS GLADIATOR Stone

(Fig. 33)

*Tabanus gladiator* Stone, Ent. Soc. Wash. Proc. 37: 12-13, 1935; Philip, Bull. Brooklyn Ent. Soc. 31: 192, 193, 1936.

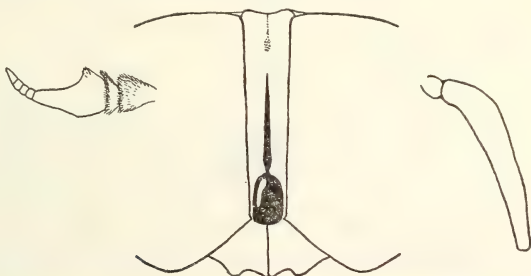


FIGURE 33.—Antenna, front view of head, and palpus of *Tabanus gladiator*.

Large; thorax lavender and abdomen orange brown; furcation and cross veins margined with brown; frons narrow; palpus very long, straplike, with apex truncate.

*Female*.—Length 22–25 mm. Eye bare. Frons about six times as high as width at base, only slightly widened above, with gray pollen, usually tinged with yellow below vertex; basal callus chestnut brown, higher than wide, and narrowly separated from eyes; median callus a slender, denuded, raised streak of same color, reaching to upper third of frons; subcallus yellow, not swollen but somewhat wrinkled. Antenna dark reddish brown, the third segment darker and annulate portion nearly black; first two segments with black hair; basal portion of third with a prominent dorsal angle and deep excision; annulate portion slightly shorter than width of basal portion. Clypeus and genae gray tinged with yellow above near eyes and with nearly white hair. Palpus orange brown, with short black hair, the second segment about 3 mm long, slender, and compressed, with apex truncate.

Mesonotum reddish brown, the fine grayish pollen giving it a lavender tone; narrow gray lines in usual pattern. Pleura reddish above, darker below, the sternum and coxae dark gray. Wing faintly tinged with brown, the costal cell orange brown; furcation and cross veins margined with brown; cell  $R_5$  nearly closed. Tibiae, except apical half of fore tibia, reddish brown, the hind tibial fringe well developed, black; rest of legs nearly or quite black.

Abdomen orange brown, sometimes with an indication of median black spots anteriorly and small pale triangles posteriorly on some of the tergites: most of abdominal hair black, but yellowish hair on hind margins of tergites laterally, and on entire ventral surface.

*Male*.—Upper facets of eye only slightly larger than those below, the line of differentiation indistinct. Palpus dark brown, with gray pollen and heavy black hair, the second segment nearly three times as long as thick. Coloration of body essentially as in female, the median black of abdomen somewhat more distinct.

Described from specimens from Monticello, Ga., and Raleigh, N. C.

*Type*.—A female, United States National Museum No. 50613. Three female paratypes, United States National Museum No. 50613.

*Type locality*.—Charleston, S. C.

*Distribution*.—Virginia to Florida. June 18 (Indiantown, Fla.) to September 23 (Chadbourn, N. C.). In the United States National Museum, 14 females, 1 male.

#### TABANUS IMITANS Walker

(Fig. 34)

*Tabanus imitans* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 146, 1848; Osten Sacken, Smithsn. Misc. Collect. No. 270, p. 228, 1878; Stone, Ent. Soc. Wash. Proc. 37: 19, 1935.

*Tabanus fuscopunctatus* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 4, pp. 338–339, 1850; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4, and sup.): 432–433, 559, 1876–78.

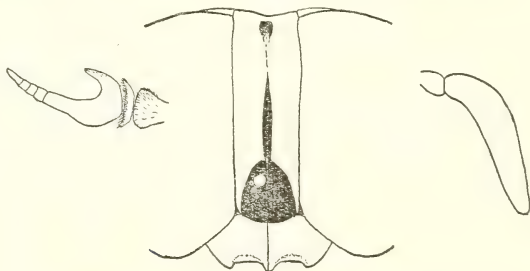


FIGURE 34.—Antenna, front view of head, and palpus of *Tabanus imitans*.

Rather large; dark reddish brown, with a median row of small white spots on abdomen; wing spotted.

*Female*.—Length 20–24 mm. Eye bare, purplish, with a single green band. Frons yellowish gray, parallel sided, about three times as high as wide; basal callus chestnut brown, slightly higher than wide, not quite touching eyes and

somewhat narrowed above; median callus a narrow concolorous line somewhat longer than basal callus; often a flat denuded spot at vertex of same color. Subcallus, clypeus, and genae yellowish brown, with yellowish hair below antennae. Antenna uniformly orange brown, the third segment with a prominent, forward-projecting, dorsal process, not quite reaching base of annulate portion. Palpus orange brown, with short concolorous and black hair, the second segment of moderate length and thickness.

Thorax above dark reddish brown, with faint gray stripes; tufts of pale hair around wing base and on pleura. Wing hyaline, the costal region and base of wing dark brown, the cross veins and furcation margined with brown and sometimes the tips of veins  $R_{2+3}$  and  $R_4$  each with a brown cloud; cell  $R_5$  somewhat narrowed apically. Legs orange brown to dark reddish brown, with concolorous hair; hind tibial fringe orange brown to black.

Abdomen dark reddish brown, with a median row of small white triangles; venter reddish brown, the sternites with narrow, pale hind margins.

*Male*.—Areas of large and small facets of eye distinctly differentiated, a narrow band of the smaller facets extending along margin to vertex. Coloration as in the female, the abdominal spots very small.

*Type*.—Female, in the British Museum.

*Type locality*.—Georgia.

*Distribution*.—North Carolina to Florida. March 26 (Silver Springs, Fla.) to June 15 (Lake Waccamaw, N. C.). In the United States National Museum, 52 females, 2 males.

#### TABANUS IMITANS variety EXCESSUS, new variety

*Tabanus fuscopunctatus* Howard (not Macquart), The Insect Book, pl. 16, fig. 9, 1901.

*Female*.—Length 19–21 mm. Differs from the typical *imitans* in that the dorsal angle of the third antennal segment is rectangular or slightly acute only and does not have the prominent forward projection, and there is a tendency for the dark spots of the wing to be more extensive, the apex of some or all of the longitudinal veins which end in the outer half of the wing narrowly margined with brown.

*Male*.—Unknown.

*Type*.—Female, United States National Museum No. 51967. Paratype, United States National Museum No. 51967; other paratypes in collections of Museum of Comparative Zoology, C. S. Brimley, C. B. Philip, and J. Bequaert.

*Type locality*.—Enterprise, Fla.

*Distribution*.—Florida (Enterprise, Eureka, Gainesville, Levy County), May.

The type was collected May 21 and is figured in Howard's Insect Book, Plate XVI, figure 9, as *fuscopunctatus*.

#### TABANUS ATRATUS Fabricius

The Black Horsefly

(Fig. 35)

*Tabanus americanus* Drury, Illustrations of Natural History, v. 1, p. 104, pl. 14, 1773. (Preoccupied by *Tabanus americanus* Forster.)

*Tabanus atratus* Fabricius, Systema Entomologiae, p. 789, 1775; Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, pp. 114–115, 1828; Bellardi, Saggio dipterologia messicana, pt. 1, p. 58, 1859; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 454–455, 1876; Smithsn. Misc. Collect No. 270, p. 57, 1878; Hart, Ill. State Lab. Nat. Hist. Bull. 4: 242, 1895; Hine, Ohio State Acad. Sci. Spec. Papers 5: 48, 1903; U. S. Dept. Agr., Bur. Ent. Tech. Ser. 12: 34–36, 1906; La State Crop Pest. Comm. Cir. 6: 15–18, 1906; La. Agr. Expt. Sta. Bull. 93: 44–45, 1907; Johnson, Psyche 26: 163–165, 1919; Davis, Ill. State Nat. Hist. Survey Bull. 13: 97–99, 1919; Bromley, Ann. Ent. Soc. Amer. 19: 440–460, 1926; Stone, Ann. Ent. Soc. Amer. 23: 294–296, 1930; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 103, 1931;



Schwardt, Ann. Ent. Soc. Amer. 25: 631-635, 1932; Kröber, Rev. Ent. 4: 306, 1934; Rowe and Knowlton, Canad. Ent. 67: 241, 1935; Schwardt, Ark. Agr. Expt. Sta. Bul. 332: 27-32, 1936.

*Tabanus niger* Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 54, 1807.

*Tabanus validus* Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, pp. 113-114, 1828.

*Straba atrata* Enderlein, Mitt. Zool. Mus. Berlin 11: 355, 1925.

*Stigmatophthalmus atratus* Enderlein, Mitt. Zool. Mus. Berlin 11: 387, 1925.

Large; black, with wing dark brown: frons broad: frontal callus transverse.

*Female*.—Length 20-28 mm. Eye bare, dark purple or bronzy black, with a narrow jet-black band across middle and a broad band of same color below. Frons brownish or grayish, two to two and one-half times as high as wide, with parallel sides; basal callus shiny black, transverse, not quite so wide as frons: median callus an indefinite line above; subcallus somewhat swollen, shiny, black

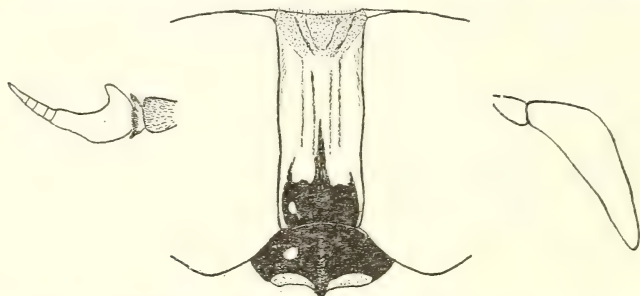


FIGURE 35.—Antenna, front view of head, and palpus of *Tabanus atratus*.

or brownish. Antenna black; first segment not noticeably enlarged; third rather slender, with a prominent, slender, dorsal process, which projects forward somewhat; annulate portion about as long as basal portion beyond dorsal process. Genae rather shiny black, with rather sparse black hair. Second palpal segment black, moderately heavy, tapering to a rather blunt apex.

Thorax, abdomen, and legs black. Mesonotum sometimes with a reddish tinge. Abdomen often pruinose. Wing almost uniformly dark brown. Cell R<sub>5</sub> decidedly narrowed at margin. Base of fore tibia sometimes whitish.

*Male*.—Area of large facets of eye extensive, the upper surface of eye flattened; small facets on lower third and the area extending along upper half of eye as a narrow margin. Body coloration as in female.

*Type*.—Collection unknown.

*Type locality*.—America.

*Distribution*.—Massachusetts and Florida west to Ontario, Idaho, and New Mexico; Mexico. February 7 (Key West, Fla.) to October 2 (Paradise Key, Fla.). In the United States National Museum, 84 females, 41 males.

This is one of the best known of the horseflies, although it has never been reported to occur in the great abundance characteristic of certain species. The larva was first described by Walsh (22) without his knowing what species he had. Hart worked out the complete life history. Bromley made a very complete study of the external morphology of the adult fly.

The type of the genus *Stigmatophthalmus* Lutz does not seem to be congeneric with this species, and the division of the genus *Tabanus* into those with the eye facets in the male differentiated (*Straba*) and those with the eye facets uniform (*Tabanus*) does not seem desirable. This species resembles the Neotropical *Tabanus erebus* Osten Sacken, of which *Astigmatophthalmus satanas* Kröber is, with

little doubt, a synonym. (New synonymy.) It is rather doubtful that *satanas*, the genotype of *Astigmatophthalmus* Kröber, can be considered generically distinct from *atratus*.

**TABANUS ATRATUS variety FULVOPILOSUS Johnson**

*Tabanus atratus* var. *fulvopilosus* Johnson, Psyche 26: 164, 1919.

*Female*.—Differs from the typical *atratus* only in the presence of bright-yellow hair on the upper half of the prescutal lobe, a streak above the wing base, and a tuft on the postalar lobe.

*Male*.—Unknown.

*Type*.—A female bearing type No. 7509 in the Museum of Comparative Zoology, herein designated as lectotype. This is one of three specimens labelled cotype, none bearing data to correspond with those mentioned in the original description.

*Type locality*.—Orlando, Fla.

*Distribution*.—Massachusetts to Florida on coast. March 12 (Haulover, Fla.), to September 17 (Pawley's Island, S. C.). In the United States National Museum, 16 females.

**TABANUS ATRATUS variety NANTUCKENSIS Hine**

*Tabanus nantuckensis* Hine, Ohio Jour. Sci. 17: 271, 1917.

*Tabanus atratus* var. *nantuckensis* Johnson, Psyche 26: 163-164, 1919.

*Female and male*.—Differs from the typical *atratus* in its somewhat smaller size (20-22 mm) and in the distinct yellowish tinge to the hind part of the wing.

*Type*.—Female, Ohio State University.

*Type locality*.—Nantucket Island, Mass.

*Distribution*.—New Hampshire to New York, on coast. June 19 to August 20 (Dorchester, Mass.). In the United States National Museum, three females, three males.

In addition to these varieties the writer has seen specimens from Cambridge, Lexington, Nantucket, Malden, Dorchester, and Marblehead, Mass., with the thoracic coloration of *fulvopilosus* and the wing coloration of *nantuckensis*.

**TABANUS MORBOSUS, new species**

(Fig. 36)

Rather large; black; wing subhyaline, the costal cell and margin of veins of basal and central portion of wing brown; frons very narrow.

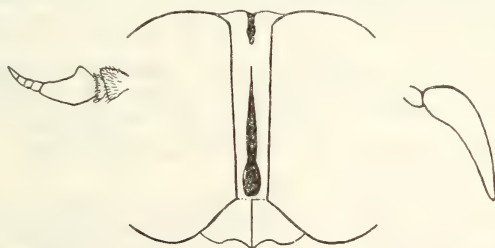


FIGURE 36.—Antenna, front view of head, and palpus of *Tabanus morbosus*.

*Female*.—Length 21 mm. Eye bare. Frons brown, six and six-tenths times as high as width at base and somewhat widened above; vertex partially denuded, with a small notch and trace of an ocellar tubercle; basal callus small, black, rather widely separated from eyes and forming a swelling at base of a

long, slender, median callus; subcallus flat, brown. Antenna black, the third segment with a blunt dorsal angle and rather deep excision; annulate portion dark brown. Clypeus and genae brown, with dense brownish-black hair. Second palpal segment moderately long and slender, black, with black hair.

Thorax dark brown, with black hair. Haltere brown, the extreme apex paler. Wing subhyaline, the costal cell and margins of all veins basad of furcation and apex of cell first  $M_2$  rather broadly margined with brown; venation normal. Legs black, the empodium and pulvilli creamy white.

Abdomen black, with black hair.

*Male*.—Unknown.

*Type*.—Female, United States National Museum No. 51968.

*Type locality*.—Huachuca Mountains, Ariz.

#### TABANUS AEGROTUS Osten Sacken

(Fig. 37, A)

*Tabanus aegrotus* Osten Sacken, U. S. Geol. and Geogr. Survey Terr. Bull. 3: 219-220, 1877; Williston, Kans., Acad. Sci. Trans. 10: 139, 1887; Hine, Ohio Nat. 5: 234, 1904; Rowe and Knowlton, Canad. Ent. 67: 240-241, 1935; Philip, Bull. Brooklyn Ent. Soc. 31: 190, 1936.

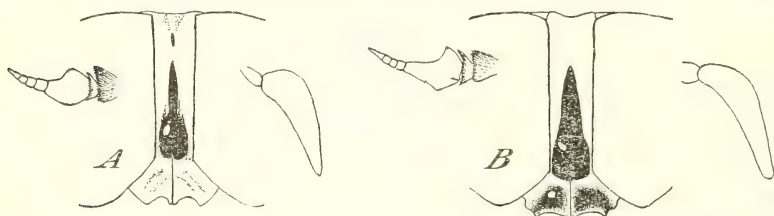


FIGURE 37.—Antenna, front view of head, and palpus of (A) *Tabanus aegrotus* and (B) *T. wiedemanni*.

Rather large; entirely brownish black; wing nearly hyaline, unspotted. (Mountains of western North America.)

*Female*.—Length 17-23 mm. Eye bare. Frons brown, about four times as high as wide, with parallel sides; basal callus flat, vertical, dull reddish brown to black, about three-fourths width of frons; median callus black or dark brown, broadly joined to frontal callus, gradually tapering above and reaching nearly to vertex; subcallus brown. Antenna black, the basal portion of third segment stout, with a prominent dorsal angle and a distinct dorsal excision; annulate portion nearly as long as basal portion. Clypeus and genae dark brown to black, with brown hair. Second palpal segment black, moderately stout at base and usually tapering to a sharp apex.

Thorax dark brown to black, with brown hair. Wing subhyaline, unspotted; costal cell yellowish brown; cell  $R_5$  somewhat narrowed apically. Legs nearly black, the hind tibial fringe well developed, black.

Abdomen colored as thorax, rarely with a median row of small whitish triangles.

*Male*.—Coloration as in female. Line of differentiation between areas of large and small facets not sharp, although usually the extreme difference in size is considerable; second palpal segment short and stout.

*Type*.—Female, Museum of Comparative Zoology.

*Type locality*.—California.

*Distribution*.—Mountains from British Columbia to southern California and Utah. June 5 (Mount Wilson, Calif.) to August 18 (Logan Canyon, Utah). In United States National Museum, 20 females, 7 males.

*Tabanus aegrotus* is near *nigrescens* Palisot, but lacks the spots on the wing and has a smaller, less shiny basal callus.



## TABANUS WIEDEMANNI Osten Sacken

(Fig. 37, B)

? *Tabanus palpinus* Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 221, pl. 3, fig. 1, 1813-20.

*Tabanus ater* Wiedemann (not Palisot de Beauvois), Aussereuropaische zweiflügelige Insekten, v. 1, pp. 136-137, 1828.

*Tabanus wiedemanni* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4, and sup.) : 455-456, 559, 1876-78.

Medium sized; black; wing dark, with rather distinct spot at furcation; basal callus subquadrate; median callus joined to it by its entire width; narrow portion of third antennal segment not remarkably elongate.

*Female*.—Length 17-20 mm. Eye bare. Frons grayish brown, three times as high as wide, with parallel sides; basal callus subquadrate, protuberant, dark shiny brown; median callus below as wide as basal callus, reaching to upper third of frons and not raised; vertex somewhat denuded; subcallus denuded, shiny brown, protuberant. Antenna black, the extreme base of third segment often orange brown; third segment with a prominent dorsal angle and deep excision and a distinct angle on ventral margin; annulate portion about equal in length to widest part of basal portion or two-thirds of basal portion. Clypeus and genae with brown pollen except just below antennae and margining clefts to clypeal pits; hair of clypeus black. Second palpal segment black, with black hair, moderate in length and thickness.

Whole body dark brownish black. Legs black. Wing dark brown, slightly paler posteriorly, the furcation and cross veins not distinctly spotted; venation normal.

*Male*.—Unknown.

*Type*.—Female, Museum of Comparative Zoology No. 4045.

*Type locality*.—Enterprise, Fla.

*Distribution*.—North Carolina to Florida. March 24 (Indian town, Fla.) to August 13 (Paradise Key, Fla.). In United States National Museum, 23 females.

*Tabanus palpinus* was described from what is obviously a male *Tabanus*, as is indicated by the structure of the palpus. According to the description and figure, however, there was considerable space between the eyes, an unusual condition in Tabanidae. It would seem quite probable that *palpinus* Palisot is *wiedemanni* Osten Sacken, but until the male of the latter is discovered, or the type of *palpinus* can be studied, the name *wiedemanni* should be retained.

## TABANUS PROXIMUS Walker

(Fig. 38)

*Tabanus proximus* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 147, 1848; Philip, Bull. Brooklyn Ent. Soc. 31:193-194, 1936.

*Tabanus benedictus* Whitney, Canad. Ent. 36:206, 1904; Hine, Ohio Nat. 5: 235, 1904; La. Agr. Expt. Sta. Bull. 93: 45-46, 1907; Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8: 85, 1933; Schwardt, Ark. Agr. Expt. Sta. Bull. 332: 33-34, 1936. (New synonymy.)

Large; dark brown; abdomen unicolorous; palpus dark brown; antenna orange; brown spot on wing at furcation; frons narrow, with sides divergent above.

*Female*.—Length 25-27 mm. Eye bare. Frons yellowish gray, about six times as high as width at base, widened above; basal callus reddish brown, narrower than frons, higher than wide, with a spindle-shaped line above becoming very narrow and reaching nearly to vertex; vertex grayish, with black hair; subcallus reddish brown, with yellowish pollen, often partially denuded. Antenna orange, first two segments with black hair; third with a prominent dorsal angle and deep dorsal excision; annulate portion shorter than width of basal portion. Clypeus and genae gray tinged with yellow, with orange-

brown to black hair. Second palpal segment of moderate length and thickness, dark brown, with black hair.

Mesoscutum dark reddish brown, with faint pollinose lines. Pleura, sternum, and coxae dark, with black hair; no white pile around wing base. Wing pale orange brown, infuscated at cross veins and furcation; costal cell and stigma darker orange brown. Legs black, the tibiae reddish basally; hind tibial fringe prominent, black.

Abdomen nearly black, with thin grayish pollen above.

*Male*.—Eye with areas of large and small facets distinctly differentiated, the latter extending around margin of eye to vertex in a narrow band. Coloration of body as in female. Clypeus and genae grayer than in *nigrescens*, which it closely resembles.

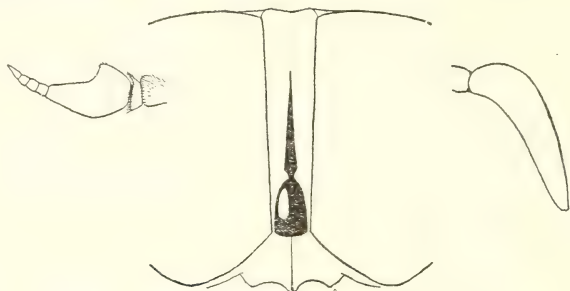


FIGURE 38.—Antenna, front view of head, and palpus of *Tabanus proximus*.

*Type*.—Female, in the British Museum.

*Type locality*.—Florida.

*Distribution*.—Illinois and Virginia to Oklahoma, Texas, and Florida. In the United States National Museum, 12 females, 6 males.

The type of *Tabanus proximus* was studied by Hine and found to be the same as *T. benedictus* Whitney.

#### TABANUS NIGRESCENS Palisot de Beauvois

(Fig. 39)

*Tabanus nigrescens*, Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 100, pl. 2, fig. 2, 1809; Wiedemann, Aussereuropaische zweiflügelige Insekten, v. 1, p. 116, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 453, 1876; Hart, Ill. State Lab. Nat. Hist. Bull. 4: 238, 1895.

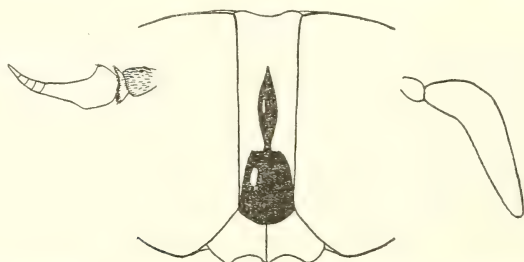


FIGURE 39.—Antenna, front view of head, and palpus of *Tabanus nigrescens*.

Rather large; black; wing subhyaline to blackish, with spots at furcation and cross veins; palpus black; frons with parallel sides.

*Female*.—Length 20–24 mm. Eye bare, dark, dull green, with three narrow purple bands, the upper one indistinct outwardly. Frons brown, three and one-half to four times as high as wide, the sides parallel; basal callus higher than

wide, somewhat narrower than frons, very dark brown; median callus usually a rather stout line, connected to basal callus; subcallus, clypeus, and genae with brown pollen, the subcallus paler; hair of clypeus and genae dark brown to black. First two antennal segments black; third reddish at base, dark brown to black apically; dorsal angle moderate, rectangular; annulate portion slightly shorter than basal portion.

Thorax and abdomen nearly black, with black hair. Legs black. Wing with costal cell strongly infuscated and with discal cell and base somewhat clouded; spots at cross veins and furcation; cell *R*<sub>2</sub> decidedly narrowed apically.

*Male*.—Areas of large and small facets of eye sharply differentiated. General color browner than female, particularly on mesoscutum.

*Type*.—Female, collection unknown.

*Type locality*.—United States.

*Distribution*.—Massachusetts and Indiana to Florida. May 25 (Murrells Inlet, S. C.) to August 7 (Nelson County, Va.). In United States National Museum, 22 females, 1 male.

#### TABANUS NIGRESCENS variety ATRIPENNIS Stone

*Tabanus nigrescens* subspecies *atripennis* Stone, Ent. Soc. Wash. Proc. 37: 15–16, 1935.

*Female and male*.—Length 24–26 mm. Wing deeply smoky, only slightly paler posteriorly, if at all.

*Type*.—A female, United States National Museum No. 50619. Paratypes, United States National Museum No. 50619; other paratypes in collections of Ohio State University and James M. Brennan.

*Type locality*.—Stillwater, Okla.

*Distribution*.—Maryland to Florida and Texas. June 7 (Monticello, Fla.) to July 20 (Doncaster, Md.).

#### TABANUS PUNCTIFER Osten Sacken

(Fig. 40)

*Tabanus punctifer* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 453–454, 1876; Hine, Ohio Nat. 5: 242, 1904; Webb and Wells, U. S. Dept. Agr., Dept. Bull. 1218: 10–20, 1924; Herms, Pan-Pacific Ent. 4: 91–92, 1927; Rowe and Knowlton, Canad. Ent. 67: 243, 1935.

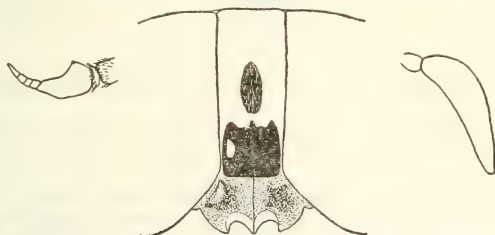


FIGURE 40.—Antenna, front view of head, and palpus of *Tabanus punctifer*.

Rather large; thorax cream colored and abdomen black; a brown spot at furcation; fore tibia bicolored.

*Female*.—Length 19–22 mm. Eye bare, greenish, with three narrow purple bands. Frons brownish gray, two and one-half to three times as high as width at base, with parallel sides; basal callus dark brown to black, subquadrate, poorly defined, the median callus even less sharply defined; subcallus brown, bare or sparsely covered with brown pollen. First two antennal segments black; third usually very dark brown, with distinct dorsal angle and excision; length of annulate portion about midway between width and length of basal portion. Clypeus and genae brown, with dark-brown hair. Second palpal segment moderately elongate, dark brown, with abundant, short, black hair.



Mesonotum covered with creamy hair over a dark-reddish ground; rest of thorax dark brown, with concolorous hair. Wing brownish, paler posteriorly, the cross veins and furcation distinctly margined with brown; cell  $R_2$  distinctly narrowed apically. Legs entirely dark, except basal third of fore tibia, which is white, with long white hair. Abdomen entirely black.

*Male*.—Coloration as in female except that the white of the mesothorax is confined to a lateral band and the outer margin of the scutellum, the rest being dark reddish brown. Area of large facets of eye extensive and very sharply differentiated from area of small ones.

*Type*.—A female from Utah herein designated as lectotype, in the Museum of Comparative Zoology. One male and four female cotypes from Utah and California in the Museum of Comparative Zoology.

*Type locality*.—Utah.

*Distribution*.—Western North America from Washington and Idaho south to Sonora and western Texas. April (Death Valley, Calif.) to October (Bowie, Ariz.). In United States National Museum, 79 females, 24 males.

#### TABANUS STYGIUS Say

(Fig. 41)

*Tabanus stygius* Say, Jour. Acad. Nat. Sci. Phila. 3: 33, 1823; Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, pp. 131–132, 1828; Say, Complete Writings, LeConte ed., v. 2, p. 54, 1859; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 454, 1876; Hart, Ill. State Lab. Nat. Hist. Bull. 4: 239–241, 1895; Hine, Ohio State Acad. Sci. Spec. Papers 5: 54, 1903; U. S. Dept. Agr., Bur. Ent. Tech. Ser. 12: 28–32, 1906; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 28–30, 116, 1931; Schwardt, Ark. Agr. Expt. Sta. Bull. 332: 48–50, 1936.

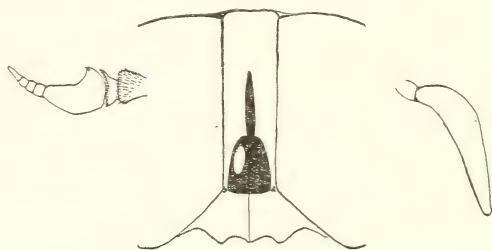


FIGURE 41.—Antenna, front view of head, and palpus of *Tabanus stygius*.

Rather large; thorax gray and abdomen black; wing subhyaline, with a spot at furcation; fore tibia unicolorous; frons orange brown, moderately narrow.

*Female*.—Length 20–23 mm. Eye bare, dark green, with two purple bands and vestige of a third above. Frons orange brown to dark brown, three and one-half to four times as high as width at base, with parallel sides; basal callus dark reddish brown, nearly as wide as frons, higher than wide, the median callus forming a projection above of about equal length or longer; vertex slightly grayish; subcallus, clypeus, and genae orange brown; hair of clypeus darker brown. Antenna orange red, the base of third segment lighter than rest; basal portion of third rather elongate, with a distinct, rectangular, dorsal angle; annulate portion about equal in length to width of basal portion at dorsal angle. Second palpal segment moderately elongate, dark brown, with darker brown, short hair.

Mesonotum with white hair and pollen through which show the reddish ground color and some indication of stripes; rest of thorax brown, with brown hair. Wing pale orange brown, paler posteriorly; cross veins and furcation margined with brown; cell  $R_2$  somewhat narrowed apically. Legs entirely brownish black. Abdomen dark brownish black.







*Male*.—Areas of large and small facets of eye sharply differentiated. Palpus dark brown, with black hair. Dorsum of thorax with chocolate-brown pollen and pile. Coloration otherwise as in female. The male can scarcely be distinguished from that of *nigrescens*, but in the latter the thorax above is even darker.

*Type*.—Female, no longer in existence.

*Type locality*.—Arkansas.

*Distribution*.—Minnesota to Massachusetts and south to Texas and Florida. April 12 (Fort Meade, Fla.) to August 15 (Lunenburg, Mass.). In United States National Museum, 23 females, 3 males.

**TABANUS SUBNIGER** Coquillett

(Fig. 42, A)

*Tabanus subniger* Coquillett, Ent. News 17:48, 1906; Stone, Ent. Soc. Wash. Proc. 37:16-17, 1935.

Large; thorax whitish and abdomen black; fore tibia uniformly dark; front of female very broad, gray.



FIGURE 42.—Antenna, front view of head, and palpus of (A) *Tabanus subniger* and (B) *T. fumipennis*.

*Female*.—Length 22-25 mm. Eye bare or very sparsely pilose. Frons gray, about twice as high as width at base, slightly narrowed above; vertex darker, with a median depression and erect black hair; basal callus shiny, dark brown, somewhat transverse, rounded and not quite touching eyes; median callus a short, indefinite line; subcallus, clypeus, and genae brown, with dark-brown hair below. Antenna dark reddish brown; first segment rather stout, although not distinctly widened apically; third rather elongate and slender, with a moderate dorsal angle and distinct dorsal excision; annulate portion as long as or slightly longer than basal portion. Second palpal segment dark brown, rather heavy, not strongly swollen at base, with black hair and a few scattered pale hairs.

Mesonotum reddish brown, with yellowish-white hair; rest of thorax dark brown, with black hair. Wing nearly hyaline, the cross veins and furcation margined with pale gray or brownish; costal cell yellowish; cell  $R_5$  slightly narrowed apically. Legs black; hind tibial fringe black, well developed.

Abdomen dark reddish brown to black; some yellowish-white hair laterally and on posterior margins of sternites.

*Male*.—Antenna black, slender, the first segment nearly as wide as third and somewhat flattened above. Areas of large and small facets of eye distinctly differentiated. Mesonotum dark brown, with indication of stripes. Rest of coloration essentially as in female.

*Type*.—Female, United States National Museum No. 8301.

*Type locality*.—Lake Forest, Ill.

*Distribution*.—Illinois, Ohio, New York, and New Jersey. June 27 (Lake Forest, Ill.) to July 20 (Ithaca, N. Y.). In United States National Museum, two females.

## TABANUS FUMIPENNIS Wiedemann

(Fig. 42, B)

*Tabanus rufus* Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 100, pl. 2, fig. 1, 1809; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. No. 4, and sup.): 456-457, 559, 1876-78. (Preoccupied by *Tabanus rufus* Scopoli.)

*Tabanus fumipennis* Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, p. 119, 1828; Stone, Ent. Soc. Wash. Proc. 37:18, 1935.

*Stigmatophthalmus rufa* Enderlein, Mitt. Zool. Mus. Berlin 11:387, 1925.

Large; orange brown; wing yellow brown, with a faint spot at furcation; abdomen broad, flat, somewhat blackened apically and medianly.

*Female*.—Length 20-26 mm. Eye bare, coppery, with three narrow, bluish, diagonal bands. Frons orange brown, three times as high as width at base, with parallel sides; basal callus shiny yellow brown to nearly black, scarcely touching eyes, about as high as wide, and rounded above; median callus short, narrow, and usually narrowly joined to basal callus; subcallus, and genae above antennae, concolorous with frons. Antenna uniformly orange; first two segments with concolorous to black hair; third with a distinct dorsal angle somewhat projecting forward; width of basal portion somewhat less than length, but slightly greater than length of annulate portion. Clypeus and lower genae somewhat paler than subcallus, with concolorous hair. Second palpal segment concolorous with antenna and with short, slightly paler hair, long and slender, the tip rather truncate, rounded.

Mesonotum reddish brown to nearly black, with mostly orange hair and a faint indication of reddish lines in usual pattern. Pleura, sternum, and coxae orange brown, with concolorous hair. Wing almost uniformly yellow brown, the costal cell somewhat darker and an infuscated spot at furcation; cell  $R_2$  greatly narrowed at margin. Legs orange brown, with concolorous hair, the hind tibial fringe well developed.

Abdomen orange brown, with a poorly defined, median, black stripe, narrow on tergites 1 and 2, gradually widening posteriorly, but usually leaving a narrow lateral margin of orange to tip of abdomen; venter orange brown, darker medianly and apically.

*Male*.—Facets of eye uniform in size throughout; genae with black hair. Thorax and fore femur darker than in female. Median abdominal stripe wider on second tergite and more nearly uniform in width the length of abdomen.

*Type*.—Male, collection unknown.

*Type locality*.—Savannah, Ga.

*Distribution*.—South Carolina to Florida. May 4 (Lake Harney, Fla.) to August 30 (10 to 40 miles east of Everglade, Fla.). In United States National Museum, 21 females, 3 males.

## TABANUS TRIMACULATUS Palisot de Beauvois

(Fig. 43, A)

*Tabanus trimaculatus* Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 56, pl. 1, fig. 5, 1807; Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, p. 137, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 439-440, 1876; Hine, Ohio State Acad. Sci. Spec. Papers 5: 55, 1903; La. Agr. Expt. Sta. Bull. 93: 58, 1907; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 30-31, 117, 1931; Schwardt, Ann. Ent. Soc. Amer. 25: 635-637, 1932; Ark. Agr. Expt. Sta. Bull. 332: 54-56, 1936.

*Tabanus quinquelineatus* Macquart, Histoire Naturelle des Diptères, v. 1, p. 200, 1834.

Medium sized; thorax largely white; abdomen above dark brown or black, with prominent, white, median triangles on tergites 3-5; a distinct, dark-brown, median stripe on venter.

*Female*.—Length 15-18 mm. Eye bare, purple, with two rather narrow green bands, the space between about twice width of either band. Frons gray tinged with yellow or brown, with black hair, four to four and one-half times as high as width at frontal callus, slightly widened above; basal callus yellowish or orange brown to nearly black, somewhat higher than wide and not quite touching eyes; median callus concolorous with basal callus and forming an extension

from it of about equal length and about one-fourth width of frons, scarcely narrowed at junction with basal callus; vertex flat, completely pollinose; subcallus pale yellowish gray, nearly flat. Antenna dark reddish brown to black, the first two segments with short black hair; first segment distinctly widened apically; second with a slender dorsal process; third with a prominent dorsal angle, the dorsal excision distinct but not very deep; width of basal portion and length of annulate portion each about three-fourths length of basal portion. Clypeus and genae below antennae pale gray, with mostly white hair. Second palpal segment pale yellowish, with a mixture of short black and white hair, moderate in thickness at base, gradually tapering to a sharp apex.

Mesoscutum brown, with five distinct light-gray lines in usual pattern; prescutal lobe reddish gray, with black hair below; scutellum with grayish pollen discally, reddish around margin, the whole with pale hair. Pleura, sternum, and coxae gray tinged with reddish and with gray hair. Wing nearly hyaline except for deep-yellow costal cell and infuscated spots at cross veins and furcation; cell  $R_5$  somewhat narrowed apically. Legs dark brown to black except for basal half of fore tibia and basal three-fourths of middle and hind

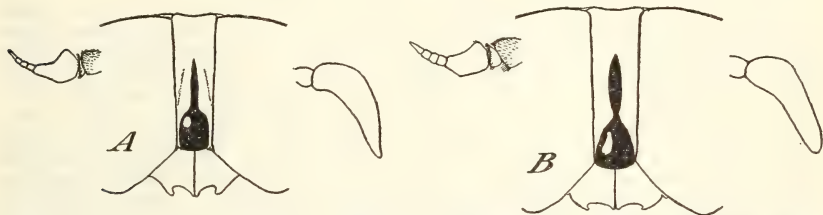


FIGURE 43.—Antenna, front view of head, and palpus of (A) *Tabanus trimaculatus* and (B) *T. molestus*.

tibiae, which are white; hair of legs largely white except for dark portions of tibiae and tarsi.

Abdomen black or reddish brown dorsally, with a prominent, median, white triangle on each of tergites 3-5, that on 3 not reaching anterior margin; sometimes tergite 2 bearing a pair of small, pale, oblique spots on each side of middle; lateral margin of each tergite with white pollen and hair; venter gray, with a broad, dark-brown, median stripe.

*Male*.—Areas of large and small facets of eye sharply differentiated, the former extensive but separated from hind margin of eye by a narrow extension of the small faceted area; in dried specimens the area of large facets usually yellow, with a broad dark band across it. Antenna and legs somewhat paler than in female, the rest of coloration as in female.

*Type*.—Female, collection unknown.

*Type locality*.—North America.

*Distribution*.—Minnesota and New York south to Texas and Georgia. June 9 (Mount Vernon, Va.) to August 20 (La Crescent, Minn.). In the United States National Museum, 32 females, 9 males.

#### TABANUS MOLESTUS Say

(Fig. 43, B)

*Tabanus molestus* Say, Jour. Acad. Nat. Sci. Phila. 3: 31-32, 1823; Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, p. 125, 1828; Say, Complete Writings, LeConte ed., v. 2, p. 53, 1859; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 438-439, 1876; Hine, La. Agr. Expt. Sta. Bull. 93: 52-53, 1907.

*Atylotus tenessensis* (sic) Bigot, Mem. Soc. Zool. France 5: 660, 1892. (New synonymy.)

Medium sized; dark brown to black, with large, gray, median triangles on abdomen, that on second tergite decidedly smaller than those on third and fourth; scutellum with white pollen and pile; fore tibia nearly uniformly dark brown.



*Female*.—Length 14–21 mm. Eye bare, purple, with two narrow green-blue bands. Frons grayish or orange brown, slightly over four times as high as width at base and only slightly widened above; basal callus chestnut brown, higher than wide, touching eyes and narrowed above; median callus of same color, about one-third as wide as basal callus, of about same length and more or less narrowly joined to it; subcallus yellowish brown or grayish. First two antennal segments orange brown, with black hair; third dark orange brown to black, the basal portion with a pronounced dorsal angle and rather shallow excision; annulate portion usually slightly shorter than basal portion. Clypeus and genae gray, with whitish hair, to brown, with brownish-black hair. Second palpal segment moderate in length and thickness, brownish, with short black hair.

Mesoscutum brownish, with distinct whitish lines in usual pattern; scutellum with white pollen and pile. Pleura, sternum, and coxae gray, with whitish hair, to brown, with brownish-black hair. Wing subhyaline, the costal cell brown, and furcation and cross veins very faintly margined with brown; venation normal. Legs nearly uniformly brown in ground color, with mostly black hair in darker specimens, but with dense, creamy-white hair on middle and hind tibiae and some on base of fore tibia in lighter specimens.

Abdomen above deep orange brown, with a median row of whitish triangles consisting of a small one on posterior margin of second tergite, broad ones, sometimes reaching anterior margin, on tergites 3–4, and smaller ones posteriorly; hind margins of tergites usually with narrow whitish bands, expanding laterally; venter grayish brown, the sternites with paler bands apically.

*Male*.—Areas of large and small facets of eye distinctly differentiated. Second palpal segment about twice as long as thick, with a small decurved apex. Thorax dark brown, with dark hair, the scutellum pale as in female and the dorsal stripes not so pronounced. Legs blacker. Pale bands of hind margins of tergites usually much broader than in female, sometimes nearly as wide as length of median triangles and therefore obliterating them.

*Type*.—Female, lost.

*Type locality*.—Missouri.

*Distribution*.—Maryland to Florida and west to Oklahoma and Texas. May 5 (Wakulla County, Fla.) to August 24 (Natural Bridge, Va.). In the United States National Museum, 63 females, 5 males.

The variation in the color of the pollen and hair of the pleura and head is unusual, but no structural, seasonal, or geographical differences could be discovered to separate the two forms, and they intergrade in color. Hine examined the type of *tenessensis* (sic) Bigot and, according to his manuscript notes, he found it to be in poor condition but unmistakably the same as *molestus*. The writer has seen a specimen compared by Hine with Bigot's type.

#### TABANUS MODERATOR, new species

(Fig. 44, A)

Rather large; dark brown, with white scutellum, a row of large white spots on abdomen, that on tergite 2 distinctly smaller than those on 3 and 4; veins  $R_{2+3}$  and  $R_4$  margined with brown; frons very narrow, widened above.

*Female*.—Length 19–20 mm. Eye bare, purple, with two green-blue bands. Frons gray tinged with yellow brown at level of median callus, about nine times as high as width at base, distinctly widened above; basal callus orange brown, about two and one-half times as high as wide, narrowed above; median callus a narrow concolorous stripe, somewhat longer than basal callus and narrowly joined to it; subcallus and top of genae yellowish brown. Antenna black, the first two segments with black hair; third with a prominent, acute, dorsal angle and a pronounced excision; annulate portion about as long as width of basal portion. Clypeus and lower genae white, with white hair. Palpus yellowish brown, the second segment moderate in length and thickness, with mixed black and pale-yellowish hair.

Mesoscutum dark brown, with five distinct, yellowish-gray stripes, the median one very slender, sublateral ones broader, fading somewhat posteriorly, and

lateral stripes broad, split by a longitudinal dark stripe above wing base; a transverse spot of dense black hair before scutellum; the latter entirely white, with white hair. Wing subhyaline, the costal cell faintly brownish and cross veins, furcation, and particularly veins  $R_{2+3}$  and  $R_4$  margined with pale brown; venation normal. Femora black, the fore femur with black hair, others with some pale hair; fore tibia black, except for extreme base, which is yellowish, with a little white hair; middle and hind tibiae white, with white hair except the extreme apices, which are blackish with black hair; tarsi black, the middle and hind tarsi with short orange hair below.

Abdomen above dark brown, with a median row of broad white spots and tergites with very narrow posterior margins, widening at lateral margins; median spot on tergite 2 much smaller than those on tergites 3 and 4, slightly smaller than that on tergite 5; venter grayish, with transverse brown bands on anterior margins of sternites 3-6, narrowed laterally; tergite 7 entirely brown.

*Male*.—Unknown.



FIGURE 44.—Antenna, front view of head, and palpus of (A) *Tabanus moderator* and (B) *T. superjumentarius*.

*Type*.—United States National Museum No. 51968. Paratypes, 2, University of Arkansas.

*Distribution*.—Type, Atlanta, Ga., June 2, 1935 (P. W. Fattig); paratypes, Sevier County, Ark., June 29, 1930.

This species is close to *molestus* Say, but differs in width of frons and in wing and leg coloration as indicated in the key.

#### TABANUS SUPERJUMENTARIUS Whitney

(Fig. 44, B)

*Tabanus superjumentarius* Whitney, Canad. Ent. 11:37, 1879; Hine, Ohio State Acad. Sci. Spec. Papers 5:55, 1903; Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8:87, 1933.

Medium sized; thorax grayish; abdomen black, with a median row of short, rather broad, gray triangles, that on second tergite very small; fore tibia uniformly dark.

*Female*.—Length 15-19 mm. Eye bare. Frons with upper third grayish, middle third brown, with a pair of slender, darker, lateral lines, and lower third yellowish, these regions not always sharply defined; about five times as high as width at base, widened above; basal callus yellow or orange brown, about twice as high as wide, not quite touching eyes, the median callus a slender extension of about same length and usually somewhat darker; subcallus pale yellowish gray, nearly flat. Antenna dark reddish brown to black, the first two segments with short black hair; first segment somewhat widened apically; second with a slender dorsal process; third with a prominent dorsal angle, the dorsal excision shallow; width of basal portion slightly less than three-fourths length; annulate portion rather slender, nearly as long as basal portion, the annuli distinct. Clypeus and genae below antennae pale gray, with mostly white hair. Second palpal segment pale yellowish gray, moderate in width at base, gradually tapering to a narrow but rather blunt apex, densely covered with short black hair.

Mesoscutum reddish brown, with five distinct, light-gray lines in the usual pattern; prescutal lobe reddish gray, with black hair below; scutellum dark grayish anteriorly, reddish apically, the whole with pale hair. Pleura, sternum, and coxae gray, with white hair near wing base and on fore coxa, the rest

mostly black. Wing with costal cell strongly yellow and anterior longitudinal veins, cross veins, and furcation faintly margined with yellow not forming distinct spots; cell  $R_5$  somewhat narrowed apically. Legs entirely dark, the tibiae tinged with orange brown; hind tibial fringe distinct, black.

Abdomen above nearly black, with a single row of median white triangles starting as a very small spot on second tergite; those on third and fourth usually somewhat larger, but rarely attaining anterior margin of segments; venter gray, with a wide, median, dark-brown stripe, not so well defined as in *trimaculatus*.

*Male*.—Areas of large and small facets of eye sharply differentiated, the former extensive but separated from hind margin of eye by a narrow band of small facets; area of large facets, in dried specimens, usually yellow, with a broad dark band across them. Clypeus and genae orange brown, with brown hair. Thorax darker than in female, with no white hair. Venter of abdomen black, with grayish incisures.

*Type*.—Female, no longer in existence.

*Type locality*.—Milford, N. H.

*Distribution*.—New Hampshire to North Carolina and west to Ohio. May 5 (Allegheny, Pa.) to August 20 (Wilton, N. H.). In the United States National Museum, 10 females, 3 males.

#### TABANUS COFFEATUS Macquart

(Fig. 45, A)

? *Tabanus nigripes* Wiedemann, Diptera Exotica, pt. 1, p. 75, 1821.

*Tabanus coffeatus* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 2, pp. 39–40, 1847; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 441–442, 1876; Hine, Ohio Nat. 5: 235, 1904; Hine, La. Agr. Expt. Sta. Bull. 93: 46, 1907; Schwardt, Ark. Agr. Expt. Sta. Bull. 332: 35, 1936.

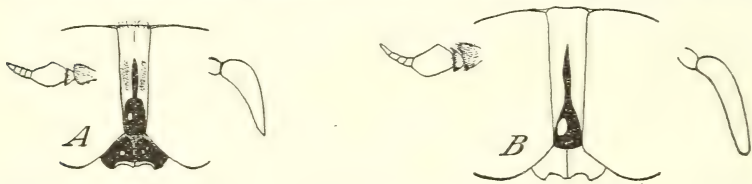


FIGURE 45.—Antenna, front view of head, and palpus of (A) *Tabanus coffeatus* and (B) *T. rufofrater*.

Rather small; brownish black, with a single median row of triangles on abdomen arising from pale posterior bands; wing hyaline; fore tibia with a few white hairs at base but not distinctly bicolored.

*Female*.—Length 11–13 mm. Eye bare, uniformly dark. Frons about four and one-half times as high as width at base, slightly widened to upper third, gray, with brown at vertex and middle; hair on brown portions black, on gray portions white; basal callus a yellowish-brown to black rectangle higher than wide and touching eyes; median callus a slender, concolorous line, joined to basal callus and of about equal length; subcallus somewhat convex, usually partially denuded and concolorous with basal callus, the pollen which is present, and which may cover whole subcallus, yellowish brown. Antenna dark orange brown to entirely black, the extreme base of third segment usually somewhat lighter than rest; first two segments with black hair, basal portion of third stout, the dorsal angle prominent, dorsal excision usually very shallow; annulate portion about equal in length to width of basal portion. Clypeus, and genae below antenna, white, with white hair. Second palpal segment moderate in length, slightly swollen at base, pale yellow or yellowish brown, with a mixture of short black and white hair.

Mesonotum reddish brown to nearly black, with four rather broad gray stripes, the median stripes going around the scutellum; prescutal lobe usually reddish brown, a fringe of black hair along lower margin. Pleura, sternum, and coxae gray, with whitish hair. Wing hyaline, with brown veins and yellow stigma; sometimes a very faint cloud at furcation and base of cell  $M_1$ ; cell  $R_5$  only very



slightly narrowed at margin. Legs reddish brown to black, the tibiae usually somewhat paler and often with considerable white hair at base.

Ground color of abdomen concolorous with that of thorax; segments 2-7 above and below with rather broad, gray, posterior bands which widen laterally and also middorsally above, where they form broad, quite prominent triangles; a similarly colored spot on middle of first tergite.

*Male*.—Head large, the areas of large and small facets of eye strongly and sharply differentiated, the latter extending as a narrow band along margin of eye to vertex; in dried specimens the large facets are brown or yellowish, with a broad, dark band across middle. Subcallus protuberant, denuded, shiny brown. Whole body dark brown, with dark hair, the gray stripes of mesonotum not so distinct and abdominal bands narrower, with median triangles much smaller than in female. Costal cell of wing slightly infuscated. Legs entirely black or dark brown, with no white hair. Venter of abdomen with narrow posterior bands.

*Type*.—Male, collection unknown.

*Type locality*.—Philadelphia.

*Distribution*.—Colorado to Massachusetts and south to Louisiana and Florida. May 2 (Ware County, Ga.) to September 6 (Provincetown, Mass.). In United States National Museum, 44 females, 5 males.

As Osten Sacken has pointed out, *Tabanus nigripes* Wiedemann, described from a male, might be the same as *coffeatus*. However, the size is too great, and, until the type can be studied, it seems better not to revert to the older name.

#### TABANUS RUFOFRATER Walker

(Fig. 45, B)

? *Tabanus unicolor* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 2, pp. 38-39, 1847. (Preoccupied by *Tabanus unicolor* Wiedemann.)

*Tabanus rufokrater* Walker, Insecta Saundersiana, Diptera, v. 1, p. 26, 1850.

? *Tabanus lateritius* Rondani, Arch. Zool. Anat. e Fisiol. 3: 80, 1864.

*Tabanus tener* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 440, 1876. (New synonymy.)

Medium sized; rather slender, dusty reddish brown, with a median row of rather large but indistinct spots on abdomen; wing unspotted, hyaline; fore tibia unicolorous.

*Female*.—Length 15-19 mm. Eye bare, purple, with two diagonal green bands. Frons about five times as high as width at basal callus, somewhat widened above, grayish, tinged with reddish brown, particularly at level of median callus; basal callus chestnut brown, higher than wide, and usually touching eyes; median callus a slender connected line reaching to upper fourth of frons; subcallus and upper genae brown. Antenna dark orange to black, the first two segments with black hair; third slightly longer than broad, with a distinct dorsal angle and only a slight excision; annulate portion slightly shorter than basal portion. Clypeus and lower genae grayish, with white hair. Second palpal segment slender, yellowish orange, with black hair.

Mesonotum brown, with broad, faint, gray lines in usual pattern; heavy black hair on prescutal lobe, white hair above wing base and on sides of scutellum. Pleura, sternum, and coxae gray tinged with brown, with white hair. Wing hyaline, with very faint brown clouds at furcation and cross veins; fore femur black, with black hair, middle femur orange brown, hind femur brownish, with dense black hair above except near apex, where hair is white; fore tibia dark orange to nearly black, sometimes with white hair on basal half, but the tibia not distinctly bicolored; middle and hind tibiae orange, the former with mostly white hair, the latter with mixed black and white hair, the tibial fringe usually mostly black; tarsi dark orange brown to black, the fore tarsus darkest.

Abdomen above reddish brown, with a median row of contiguous, indistinct, grayish triangles and some gray at hind margin of tergites laterally; venter reddish gray, darker apically.

*Male*.—Strikingly different from female because of the nearly black thorax and mostly pale abdomen. Areas of large and small facets of eye distinctly differentiated, the former extensive and not greatly enlarged; hair of genae mostly black; palpus dark orange brown, with black hair, the apex acute and slightly decurved. Thorax dark brown, with black hair except for white hair around margin of scutellum; wing as in female; legs mostly dark, with black hair, but some white hair at apices of middle and hind femora and on hind tibia. Second tergite with anterior half medianly dark brown, with black hair, posterior half medianly, and even more laterally, pinkish, with white hair; on tergites 3-6 the paler color covering most of surface, leaving very little of the darker color anteriorly; venter mostly yellowish or reddish, with white hair, the first and second sternites somewhat darkened at least medianly and very narrow, dark, anterior bands beyond this.

Described from a specimen collected at Monticello, Fla., April 16, 1935, by G. B. Fairchild.

*Type*.—Female, in the British Museum.

*Type locality*.—Georgia.

*Distribution*.—Georgia, Florida, and Mississippi. April 16 (Monticello, Fla.) to June 23 (Mimsville, Ga.). In the United States National Museum, 18 females, 2 males.

Osten Sacken examined the type of *Tabanus unicolor* Macquart in Bigot's collection and declared it to be an unrecognizable species, perhaps *T. tener*. The name being preoccupied, Rondani proposed the new name *T. lateritius*. The type of *T. rufofrater* was studied by Hine and was found to be the same as *T. tener* Osten Sacken.

#### TABANUS CATENATUS Walker

(Fig. 46)

*Tabanus catenatus* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 148, 1848; Osten Sacken, Smithsn. Misc. Collect. No. 270, p. 227, 1878.

*Tabanus orion* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 442-443, 1876; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 113, 1931.

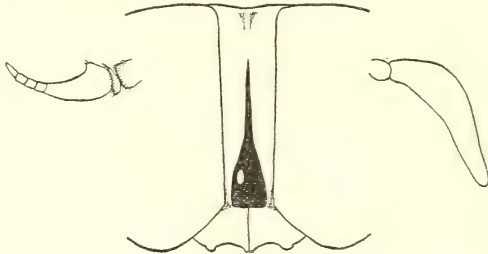


FIGURE 46.—Antenna, front view of head, and palpus of *Tabanus catenatus*.

Large; brown, with a median row of narrow white triangles on abdomen; wing brownish but no distinct spot at furcation; fore til a uniformly brown; third antennal segment largely black; cell  $R_5$  wide open.

*Female*.—Length 22-25 mm. Eye bare. Frons yellowish gray; about four and one-half times as high as width at base, very slightly widened above; basal callus chestnut brown, as wide below as frons, vertical, tapering to a slender median callus of same color, the two combined reaching about two-thirds length of frons; subcallus flat, yellowish gray. Antenna reddish, the third segment black beyond dorsal angle; first two segments with short black hair and a few short hairs at ventral angle of third segment; basal portion of third rather slender, with a distinct dorsal angle and excision; annulate portion about two-thirds length of basal portion. Clypeus and genae reddish, with gray pollen and white hair. Second palpal segment moderately long and

stout, tapering to a blunt apex, dark reddish brown, with short black hair, sometimes mixed with pale hair.

Mesoscutum and scutellum reddish brown, with brownish pollen, the former with rather indistinct, alternate stripes of dark and pale hair; prescutal lobe with considerable black hair. Pleura and sternum reddish brown, with gray pollen and yellowish-white hair. Wing subhyaline, the costal cell deeply infuscated and whole fore part of wing uniformly dark reddish brown. Legs reddish brown, the tibiae somewhat paler and tarsi darker than femora; hair of tibiae, including hind tibial fringe, pale yellowish brown.

Abdomen dark reddish brown, with small, narrow, median, white triangles on hind margins of tergites 1-6; some pale hair on lateral margins of tergites 2-5; venter gray, with a rather distinct, broad, median, brown stripe; hind margins of each sternite with a narrow fringe of yellowish hair.

*Male*.—Eye flattened above, the areas of large and small facets distinctly differentiated. Coloration of body as in female, but considerably darker, all the hair brown or black, the abdominal triangles faint and hind tibial fringe dark brown.

*Type*.—In the British Museum.

*Type locality*.—Massachusetts.

*Distribution*.—Southern Canada and United States west to Minnesota and south to North Carolina. June 27 (Ware, Mass.) to September 13 (Ramsey, N. J.). In the United States National Museum, 14 females, 6 males.

Osten Sacken examined specimens of *Tabanus catenatus* Walker in the British Museum and declared them to be *T. turbidus* Wiedemann and *T. giganteus* Degeer. Hine, in his manuscript notes made at the British Museum, stated that *catenatus* was nearer *orion* Osten Sacken than any other species. Dr. John Smart very kindly compared three specimens which the writer sent him with the type of *catenatus*. He found them to agree so closely that he could "feel confident that they are the same species." Since only one specimen is mentioned in Walker's original description it is difficult to tell what Osten Sacken examined. Some of the cotypes of *orion* came from Massachusetts, while *turbidus* never occurs there and *giganteus* probably rarely, if ever.

#### TABANUS ACTAEON Osten Sacken

(Fig. 47, A)

*Tabanus actaeon* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 443, 1876; McAtee and Walton, Ent. Soc. Wash. Proc. 20: 201-202, 1918; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 101, 1931.

Rather large; brownish, with a median row of small white triangles on abdomen; wing unspotted.

*Female*.—Length 19-21 mm. Eye bare, unicolorous. Frons about three and one-half times as high as wide, parallel sided, gray, somewhat browner medianly; basal callus chestnut brown to black, higher than wide, not quite touching eyes and abruptly narrowing to a narrow median callus reaching to upper third of frons; subcallus pale brownish. First two antennal segments reddish brown, with black hair; third nearly or quite black, except at extreme base, the dorsal angle prominent, rectangular, and the excision deep; annulate portion about two-thirds length of basal portion. Clypeus and genae gray, with white hair. Second palpal segment brown, with short black hair, moderately heavy and elongate, the apex rather blunt.

Mesonotum black, with reddish lines in the usual pattern and a mixture of yellowish brown and black hair; prescutal lobe reddish brown or black. Pleura, sternum, and coxae gray, in part tinged with reddish, and with white hair. Wing nearly hyaline, unspotted; cell  $R_5$  slightly narrowed apically. Femora reddish brown, the fore femur darkest; tibiae yellowish brown, the apical half of fore tibia and extreme apices of others dark; division between light and dark areas on fore tibia sharp; hair of pale portion of all tibiae light yellowish; hind tibial fringe mostly white; tarsi dark brown to black.



Abdomen above dark orange brown, with a median black stripe, which often widens apically; in this dark stripe a row of small, but usually distinct, whitish triangles; posterior margins of tergites laterally with white hair; considerable variation in the extent of the black, in some consisting of a very narrow stripe and in others covering most of the abdomen; venter reddish, with a distinct, broad, median stripe of dark brown; hind margins of sternites with a thin white fringe.

*Male*.—Eye with areas of large and small facets sharply differentiated, the small facets extending around margin of eye to vertex; upper surface of eye somewhat flattened. Second palpal segment about twice as long as greatest width, blunt at apex, pale reddish, with black and white hair. Mesonotum with long grayish hair. Hind tibial fringe a mixture of black and white. Rest of coloration much as in female.

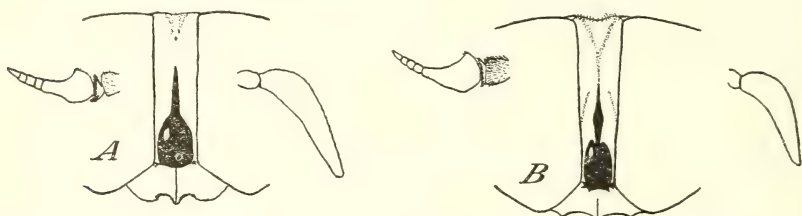


FIGURE 47.—Antenna, front view of head, and palpus of (A) *Tabanus actaeon* and (B) *T. lacustris*.

*Type*.—One of the four cotype females now in the Museum of Comparative Zoology, No. 4036, labelled and herein designated as lectotype.

*Type locality*.—Massachusetts.

*Distribution*.—Minnesota to Nova Scotia and south in Atlantic States to North Carolina. July 25 (Melrose Highlands, Mass.) to September 23 (Mount Holyoke Gap, Mass.). In the United States National Museum, 18 females, 1 male.

This species resembles *catenatus* Walker, but, in addition to the characters mentioned in the key, *actaeon* is somewhat smaller, the abdomen has more black, the white triangles are somewhat broader at base, and the hind tibia is considerably paler. In the male the genae are pale grayish in *actaeon*, yellowish in *catenatus*.

#### TABANUS LACUSTRIS Stone

(Fig. 47, B)

*Tabanus lacustris* Stone, Ent. Soc. Wash. Proc. 37: 13-14, 1935.

Medium sized; dark brown, with a median row of prominent gray triangles on abdomen; fore tibia bicolored; a stump vein and infuscated spot at furcation; cell  $R_5$  closed or very much narrowed.

*Female*.—Length 16-19 mm. Eye bare. Frons yellowish gray, with dark streaks to each side of median callus and with short black hair, five and one-half to six times as high as width at basal callus and slightly widened above; basal callus dark reddish brown, narrowly separated from eyes and distinctly higher than wide; median callus a slender connected line of same color; subcallus flat, yellowish gray. Antenna nearly or quite black, with black hair; first segment considerably widened apically; second with strong dorsal process; third with basal portion about two-thirds as broad as long, the dorsal angle prominent and dorsal excision deep; annulate portion slender, slightly shorter than width of basal portion. Clypeus and genae gray, with white hair. Second palpal segment moderately enlarged at base and distinctly tapering apically, yellowish white, with short, mostly black hair.

Mesoscutum and scutellum reddish brown, the former with faint lines of grayish pollen and pile; prescutal lobe with dense black hair. Pleura paler, with a mixture of whitish and black hair. Wing hyaline, with costal cell and stigma yellowish brown, a faint brownish tinge along anterior longitudinal veins and cross veins, and a rather distinct spot at furcation; vein  $R_4$  with a short stump; cell  $R_5$  nearly or quite closed, or sometimes slightly petiolate. Coxae gray; rest of legs black except for white on basal half of fore tibia and slightly more, basally, on middle and hind tibiae.

Dorsum of abdomen nearly black, with a distinct row of median white triangles on tergites 1-6, and narrow bands on hind margins, widening laterally; venter dark reddish to black, with rather wide bands on hind margins of sternites.

*Male*.—Areas of large and small facets of eye sharply differentiated, the former extensive; second palpal segment stout, creamy white, with black hair apically. White on fore tibia reduced to basal third; cell  $R_5$  only slightly narrowed. Rest of coloration essentially as in female.

Described from a single male in the Cornell University Collection from Billy's Island, Okefenokee Swamp, Ga., July 1912, with two females bearing the same data.

*Type*.—Female, United States National Museum No. 50616. Paratypes, United States National Museum No. 50616.

*Type locality*.—Lakeland, Fla.

*Distribution*.—Georgia and Florida. May 30 (St. Cloud, Fla.) to June 14 (Sebring, Fla.). In the United States National Museum, 12 females.

#### TABANUS PETIOLATUS Hine

(Fig. 48, A)

*Tabanus petiolatus* Hine, Ohio Jour. Sci. 17: 270, 1917.

Medium sized; brown, with a median row of prominent white triangles on abdomen; fore tibia bicolored; hind tibia nearly uniformly yellowish brown; cell  $R_5$  closed and usually petiolate.



FIGURE 48.—Antenna, front view of head, and palpus of (A) *Tabanus petiolatus* and (B) *T. melanocerus*.

*Female*.—Length 15-17 mm. Eye bare. Frons yellow, tinged with gray at vertex, about seven times as high as width at base and somewhat widened above; basal callus dark brown, narrowly separated from eyes and about twice as high as wide; median callus a slender, concolorous line reaching slightly above middle of frons; subcallus and upper genae yellowish. Antenna nearly black, except extreme base of third segment, which is reddish orange; first two segments with black hair; basal portion of third rather stout, with a distinct dorsal angle and moderate excision; annulate portion about as long as width of basal portion. Clypeus and lower genae white, with white hair. Palpus creamy white, with a mixture of concolorous and black hair, the second segment moderately stout at base and tapering to a slender apex.

Mesonotum dark grayish, with reddish-brown longitudinal stripes in usual pattern and prescutal lobe and hind margin of scutellum reddish brown. Pleura, sternum, and coxae grayish, with mostly white hair. Wing subhyaline, with cell  $R_5$  closed and usually petiolate, and occasionally a very small stump

from vein  $R_4$ . Fore femur black, the middle and hind femora gray tinged with orange; tibiae yellowish brown, the apical third of fore tibia black; hind tibial fringe mostly black; fore tarsus black, the middle and hind tarsi dark reddish brown.

Abdomen above dark orange brown, with a median row of prominent white triangles on tergites 2-5 and a small spot on tergites 1 and 6; the triangles contiguous and that on first tergite expanding slightly anteriorly; venter light reddish gray, with paler incisures.

*Male*.—Unknown.

*Type*.—Female, in the collection of Ohio State University.

*Type locality*.—Lecompte, La.

*Distribution*.—Delaware, Florida, and Louisiana. May 18 (Cody, Fla.) to July 28 (Rising Sun, Del.). In the United States National Museum, 13 females.

This is close to *melanocerus* Wiedemann, but in addition to the key characters it is usually somewhat smaller, the frons is even narrower, and the median spot on the second tergite expands slightly anteriorly to join the small spot on the first tergite.

#### TABANUS MELANOCERUS Wiedemann

(Fig. 48, B)

*Tabanus melanocerus* Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, pp. 122-123, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 440-441, 1876; Hine, La. Agr. Expt. Sta. Bull. 93: 51-52, 1907; Brimley, Ent. News 22: 133, 1911; Philip, Bull. Brooklyn Ent. Soc. 31: 193, 1936.

Medium sized; dark brownish, with a median row of large white triangles on abdomen; fore tibia bicolored; wing hyaline, the furcation with no stump vein or infuscation.

*Female*.—Length 16-19 mm. Eye bare, uniformly dark. Frons gray, often tinged with brown at the median callus and vertex, five to six times as high as width across basal callus, somewhat widened above; basal callus dark brown, higher than wide, nearly touching eyes; median spot a slender streak of same color joined to, and somewhat longer than, basal callus; subcallus yellowish gray. Antenna black, the first two segments and extreme base of third often tinged with orange; basal portion of third with a distinct dorsal angle, the dorsal excision moderate; annulate portion shorter than basal portion. Second palpal segment moderately stout at base, the apex tapering, cream colored, with concolorous and black hair.

Mesonotum reddish brown, with thin gray pollen and lighter gray, pollinose stripes in usual pattern; prescutal lobe orange brown, with black hair. Pleura, sternum, and coxae gray, with some black hair on episternum, the remainder white. Wing hyaline, the costal cell only slightly darkened; cell  $R_5$  extremely narrowed or closed, but not petiolate apically. Femora dark, the fore femur black with black hair, the others with some gray pollen and white hair; tibiae yellowish white, with concolorous hair except apical third of fore tibia, which is black, with black hair, and some darkening at apex of hind tibia; scattered black hair on pale portion of tibia, the hind tibial fringe black; tarsi dark brown.

Abdomen above brownish black, with a median row of large white triangles and narrow, posterior, pale borders on tergites, extending forward at extreme lateral margins; pale spot on first tergite small; tergites 2-5 with triangles about equal in size, that on tergite 2 rarely extending to anterior margin, and, if so, only very narrowly, the others usually extending length of tergites; venter grayish, usually with dark median patches, narrowed behind, on each tergite.

*Male*.—Areas of large and small facets of eye sharply differentiated, the small ones reaching to vertex in a narrow outer border; frontal triangle black above, yellowish below. Coloration essentially as in female, but body somewhat darker and the median white abdominal triangles not so large.



Described from specimen collected at Orlando, Fla., June 7, 1931, by D. T. Ries.

*Type*.—Female, collection unknown.

*Type locality*.—Kentucky.

*Distribution*.—Connecticut to Florida. March 29 (Paradise Key, Fla.) to August 19 (Hilliard County, Fla.). In the United States National Museum, 40 females, 3 males.

It is extremely doubtful that this is the same as *Tabanus exaestuans* Linnaeus from Surinam or that *melanocerus* occurs in Central America, as has been suggested by Osten Sacken and Kröber (11).

#### TABANUS TRIJUNCTUS Walker

(Fig. 49, A)

*Tabanus trijunctus* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 5, sup. 1, p. 182, 1854; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 432, 1876; Mosier and Snyder, Ent. Soc. Wash. Proc. 20: 118–126, 1918; Philip, Bull. Brooklyn Ent. Soc. 31: 195, 1936.

Medium sized; blackish, with a median row of broad white triangles on abdomen; venter black, with prominent white bands; wing orange brown, with a distinct spot at furcation; fore tibia unicolorous.

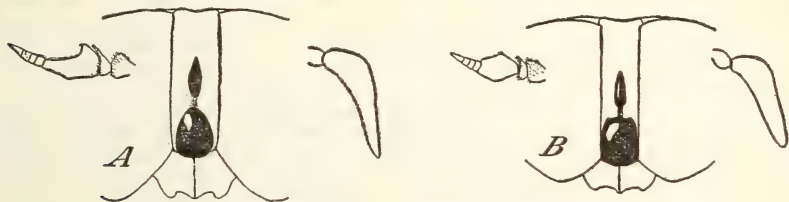


FIGURE 49.—Antenna, front view of head, and palpus of (A) *Tabanus trijunctus* and (B) *T. endymion*.

*Female*.—Length 15–21 mm. Eye bare, purple, with two green bands. Whole head grayish yellow; frons about three and one-half times as high as width at base, slightly widened above; basal callus black, shiny, higher than wide, touching eyes at bottom only; median callus black, spindle shaped, joined to basal callus; subcallus quite flat. Antenna orange brown, the first segment slightly darker; second with a strong dorsal process; third rather slender, with a prominent dorsal angle and deep excision; annulate portion shorter than basal portion. Clypeus and genae with yellow hair. Second palpal segment slender, dark orange brown, with a mixture of short black and orange hair.

Mesonotum dark reddish brown, with yellowish pollen and short black hair; prescutal lobe and middle of pleura with dense black hair; yellow hair above and below wing base and around margin of scutellum. Wing strongly suffused with orange brown except at apex and along hind margin, where it is subhyaline; furcation and cross veins distinctly margined with brown; cell  $R_5$  strongly narrowed apically. Legs orange brown, with orange hair, except coxae, which are yellowish gray, with black hair, fore femur, which is black, with black hair, except at apex, and apex of fore tibia sometimes, and tarsi always, which are darkened; hind tibial fringe well developed, concolorous with tibia.

Abdomen above black, with considerable orange brown on sides of tergites 1–3; tergites 1–5 with narrow, yellowish-white, posterior bands which widen to form a row of prominent median triangles and also widen slightly laterally; sternites black, with prominent white bands on hind margins.

*Male*.—Eye somewhat flattened above, the areas of large and small facets distinctly differentiated, the small facets extending along upper margin of eye; palpus black, with black hair. Rest of coloration much as in female, but no trace of white on fifth tergite.

Described from specimens collected by C. A. Mosier and T. E. Snyder at Paradise Key, Fla., in April 1918.

*Type*.—Female, in the British Museum.

*Type locality*.—Florida.

*Distribution*.—Florida and Bahamas. March 25 (Homestead, Fla.) to June 4 (Paradise Key, Fla.). In the United States National Museum, 56 females, 12 males.

TABANUS ENDYMION Osten Sacken

(Fig. 49, B)

*Tabanus endymion* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (sup.): 556-557, 1878.

Medium sized, slender; brown, with a median row of large whitish triangles on abdomen; furcation with infuscated spot; fore tibia uniformly brown; frons rather narrow; basal callus large, shiny; third antennal segment with no dorsal excision.

*Female*.—Length 13-18 mm. Eye bare, purple, with two green-blue bands. Frons brown, grayer towards vertex, about four times as high as wide, with parallel sides; basal callus a brown, shiny rectangle touching eyes and somewhat higher than wide; median callus a rather narrow concolorous extension of about same length. Subcallus, clypeus, and genae pale gray, the former slightly tinged with yellow. Lower genae with rather short, nearly white hair. Antenna nearly uniformly brown although occasionally somewhat darkened apically; first two segments with black hair; third with a distinct dorsal angle but no dorsal excision; annulate portion about equal in length to width of basal portion. Second palpal segment orange brown or reddish, moderately stout at base, with a mixture of short black and white hair.

Mesoscutum reddish brown, with gray pollen and rather distinct longitudinal lines of pale hair; scutellum somewhat paler; prescutal lobe with white hair above and a prominent patch of black hair along lower margin. Pleura, sternum, and coxae gray, with mostly white hair. Wing nearly hyaline, the costal cell slightly darker; furcation and cross veins margined with brown, the infuscation at base of cell  $M_1$  somewhat wider than that at base of cell  $M_2$ ; cell  $R_5$  somewhat narrowed apically. Legs orange brown or dull reddish brown, the tarsi somewhat darker, with black and white hair; hind tibial fringe short and black.

Abdomen reddish brown, the tergites with grayish bands which expand laterally and even more medianly, where they form broad triangles, largest on tergites 2-5; second tergite occasionally with a pair of faint, oblique, sub-lateral spots; sternites with very wide, pale bands.

*Male*.—Head small, the areas of large and small facets distinctly differentiated along lower margin of former, but their extent limited and the small facets extending in a broad band along upper margin of eye; first two antennal segments darker than third; palpus dark purplish brown, with black hair. Anterior margin of mesoscutum, postalar lobe, and scutellum with white hair, the rest of thoracic dorsum mostly black haired; femora somewhat darker than in female and no white hair on legs beyond coxae. Pale abdominal bands on tergites 2-4 wide, but not forming a median row of triangles; a dark spot on center of second tergite anterior to pale band; fifth tergite with pale band divided into three spots; sixth entirely dark; venter with pale bands on sternites 2-4 not wider than those dorsally, the sternites posterior to these mostly black.

*Type*.—The female of a pair of cotypes, Museum of Comparative Zoology No. 4047, herein designed as lectotype.

*Type locality*.—Georgia.

*Distribution*.—Atlantic coast from North Carolina to Florida. May 11 (West Palm Beach, Fla.) to September (Mimsville, Ga.). In the United States National Museum, five females, two males.

## TABANUS CHELIOPTERUS Rondani

(Fig. 50, A)

? *Tabanus cingulatus* Macquart, Diptères exotiques nouveaux ou peu connus, v. 1, pt. 1, pp. 144-145, 1838. (Preoccupied by *Tabanus cingulatus* Thunberg.)

*Tabanus cheliophterus* Rondani, Nuovi Ann. Stor. Bologna (3) 2: 192-193, 1850; Osten Sacken, Smithsn. Misc. Collect. No. 270, p. 228, 1878.

*Tabanus fronto* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 431-432, 1876; Hine, La. Agr. Expt. Sta. Bull. 93: 48-49, 1907.

*Tabanus subfronto* Philip, Jour. Kans. Ent. Soc. 9: 100-101, 1936. (New synonymy.)

Medium sized; orange brown, with a row of yellow median triangles on abdomen; fore tibia unicolorous; wings heavily spotted; frons rather broad; third antennal segment with a distinct excision.



FIGURE 50.—Antenna, front view of head, and palpus of (A) *Tabanus cheliophterus* and (B) *T. recedens*.

*Female*.—Length 15-20 mm. Eye bare, purplish, with two diagonal green bands. Frons grayish yellow, three to three and one-half times as high as wide, with parallel sides; basal callus yellowish brown, shiny, flat, slightly higher than wide, prolonged in a variable line of same color above; subcallus, clypeus, and genae pale brownish, the clypeus and genae with concolorous hair. Antenna entirely orange except extreme apex, which may be black; first and second segments with black hair; third moderately wide at base, with a prominent dorsal angle and usually a deep dorsal excision. Second palpal segment elongate, slender, brown, with short black hair.

Mesoscutum reddish brown, with pale brown lines; scutellum, pleura, sternum, and coxae with pale-brown pollen and hair; some black hair on prescutal lobe and below it. Wing hyaline, with brown veins, the costal cell, margins of cross veins, and furcation strongly tinged with brown, the margins of longitudinal veins broadly but more faintly so; cell  $R_5$  distinctly narrowed at margin. Legs predominantly orange brown, the fore tibia nearly unicolorous; fore femur and tarsus sometimes nearly black; hind tibial fringe indistinct, orange brown.

Abdomen orange brown, the apical segments darker; hind margins of segments paler, with a rather uniform row of yellowish triangles, that on second tergite, at least, preceded by a dark spot; venter rather uniformly brown, with paler hind margins.

*Male*.—Areas of large and small facets of eye sharply differentiated, the small facets occupying lower third and extending along outer margin to vertex. Coloration of body essentially as in female.

Described from specimen collected at New Orleans, La., August 16, 1913, by J. R. Horton.

*Type*.—Female, in the Royal Museum, Turin.

*Type locality*.—Carolina.

*Distribution*.—Virginia to Florida and west to Texas. May 18 (Greenville, Fla.) to September 2 (Mimsville, Ga.). In the United States National Museum, 19 females, 1 male.

Osten Sacken examined the type of *cheliophterus* Rondani and declared it to be, apparently, a badly rubbed *Tabanus fronto* Osten Sacken. The writer knows of no other species of this size with the



wings as described by Rondani, so he feels that the name should be used. Macquart's description of *T. cingulatus* more nearly approaches this species than any other Nearctic species known, but the description is not clear enough to make this determination certain and, in any case, the name *cingulatus* is preoccupied by Thunberg. From a study of two paratypes of *T. subfronto* Philip and a number of other specimens agreeing at least partially with the description, it is the writer's opinion that it cannot be considered specifically distinct. There seems to be complete intergradation in color, and the correlation between size and coloration does not hold.

**TABANUS RECEDENS Walker**

(Fig. 50, B)

*Tabanus recedens* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 147, 1848; Williston, Kans. Acad. Sci. Trans. 10: 138-139, 1887.

*Tabanus confusus* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 147, 1848. (New synonymy.)

*Tabanus catenatus* Osten Sacken (not Walker), Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 433-434, 1876; Smithsn. Misc. Collect. No. 270, p. 227, 1878.

*Tabanus fur* Williston, Kans. Acad. Sci. Trans. 10: 139-140, 1887. (New synonymy.)

Large; dark brown, with a median row of small, but elongate, white triangles on abdomen; fore tibia unicolorous; furcation with distinct brown spot; frons rather broad; third antennal segment with deep dorsal excision.

*Female*.—Length 21-25 mm. Eye bare, purple, with two green bands. Frons yellowish gray, two and one-half to three times as high as wide, with nearly parallel sides; basal callus chestnut brown, usually not touching eyes, slightly higher than wide, and tapering to the concolorous, rather narrow, median callus; the latter often extending upward to join a triangular, flat, denuded area at vertex; subcallus, clypeus, and genae dull yellowish, below with concolorous hair. Antenna orange, the first two segments slightly darker, with mostly yellowish hair; third with a prominent, acute, dorsal angle and deep dorsal excision; annulate portion about as long as greatest width and two-thirds length of basal portion. Second palpal segment orange brown, with a mixture of concolorous and a few black hairs.

Mesoscutum dark brown, with distinct gray lines in the usual pattern; scutellum entirely gray. Pleura, sternum, and coxae yellowish gray, with yellow hair. Wing subhyaline tinged with yellowish brown, the costal cell and veins dark orange brown and furcation and cross veins margined with brown; venation normal. Legs almost uniformly orange brown, with brownish hair, but occasionally some black hair in hind tibial fringe.

Abdomen above dark reddish brown, with a median row of distinct, but rather small, elongate, whitish triangles; triangle on second tergite reaching about half way to anterior margin, the others nearly or quite contiguous; extreme lateral margins of tergites bordered the full length with whitish pollen and hair; venter reddish brown, with thin grayish pollen.

*Male*.—Eye with large and small facets but line of differentiation not always distinct, the difference in size not being marked. Coloration of body as in female.

*Type*.—Female, in the British Museum.

*Type locality*.—Florida.

*Distribution*.—Massachusetts to Florida. May 29 (Odessa, Del.) to August (Lakehurst, N. J.). In the United States National Museum, 12 females, 4 males.

The type of *Tabanus confusus* was examined by Hine and found to be the same as *T. recedens*, and while the former has page priority it does not seem desirable to change so well established a name. The type localities of these species, Georgia and Florida, respectively, are

farther south than the locality of any specimens seen by the writer with the possible exception of the *Tabanus fur* type. Osten Sacken wished to retain the name *catenatus* for this species although admitting that it was the same as Walker's *recedens* and not the same as Walker's *catenatus*. A type specimen of *Tabanus fur* Williston was examined by the writer and it proves to be this species. The type locality of *fur* is Florida although this specimen bears the label "Conn. Williston." It must be noted that this is not the same *fur* as the one which Williston (24) described in 1901.

**TABANUS NEFARIUS Hine**

(Fig. 51, A)

*Tabanus nefarius* Hine, Ohio Nat. 8: 224, 1907.

Rather large; brown, with a median row of grayish triangles on abdomen; fore tibia unicolorous; a brown spot at furcation; frons narrow; R<sub>2</sub> nearly or quite closed apically.

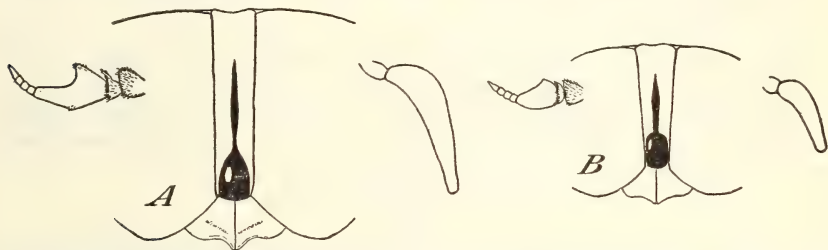


FIGURE 51.—Antenna, front view of head, and palpus of (A) *Tabanus nefarius* and (B) *T. coarctatus*.

*Female*.—Length 21–22 mm. Eye bare. Frons brown, about five times as high as width at base, somewhat widened above; basal callus orange, higher than wide, not quite touching eyes, and narrowed above; median callus a slender orange line, about twice as long as basal callus and joined to it; subcallus, clypeus, and genae brown, with concolorous hair below. Antenna orange, the first two segments with black hair and third with a prominent dorsal angle which projects forward slightly; annulate portion scarcely more than half length of basal portion. Second palpal segment of moderate length and thickness, brown, with black hair.

Thorax brown, the mesoscutum with faint yellowish-brown stripes; hair around wing base paler than the brownish hair elsewhere. Wing subhyaline, with prominent brown spots at furcation and cross veins and a yellowish-brown costal cell; cell R<sub>2</sub> closed or strongly narrowed apically. Legs nearly uniformly brown, with concolorous hair including the well developed hind tibial fringe; tarsi darker.

Abdomen brown, above with a median row of grayish-yellow triangles joined to the narrow posterior borders of same color on each tergite.

*Male*.—Unknown.

*Cotypes*.—Three females, in the collection of the Ohio State University.

*Type localities*.—New Orleans and LeCompte, La.

*Distribution*.—Southern Louisiana. June 18 to August 24 (New Orleans). In the United States National Museum, one female.

**TABANUS COARCTATUS Stone**

(Fig. 51, B)

*Tabanus coarctatus* Stone, Ent. Soc. Wash. Proc. 37: 13, 1935.

Medium sized; brownish, with a median row of large triangles on abdomen; furcation with a small infuscated spot; fore tibia uniformly brown; frons

narrow, widened above; annulate portion of third antennal segment shorter than basal portion.

*Female*.—Length 14–17 mm. Eye bare, dark purple, with two blue-green bands. Frons yellowish brown, grayer at vertex, five and one-half to six times as high as width at basal callus and widened above; basal callus a rectangle, higher than wide and touching eyes; median callus slender, somewhat longer than basal callus; subcallus concolorous with frons. First two antennal segments reddish brown, with black hair; third entirely black, the basal portion slightly longer than broad, with a prominent but obtuse dorsal angle and scarcely any dorsal excision; annulate portion shorter than basal portion. Clypeus and genae grayish brown, with pale hair. Second palpal segment slender but tapering only slightly, light brownish, with short, slightly paler hair.

Mesoscutum brown, with paler pollinose stripes; scutellum tan, with concolorous hair. Pleura, sternum, and coxae grayish brown. Wing nearly hyaline, the costal cell yellowish brown; longitudinal veins of fore part of wing weakly margined with brown and rather distinct infuscations at furcation and base of cell  $M_1$ . Legs nearly uniformly reddish brown.

Abdomen above brown, with a median row of large tan triangles arising from posterior bands, which widen laterally nearly to form sublateral triangles; venter uniformly light brown.

*Male*.—Unknown.

*Type*.—Female, United States National Museum No. 50615.

*Type locality*.—Immokalee, Fla.

*Distribution*.—Georgia to Florida. April 28 (Monticello, Fla.) to June 16 (Immokalee, Fla.). In the United States National Museum, 13 females.

#### TABANUS TURBIDUS Weidemann

(Fig. 52)

*Tabanus turbidus* Wiedemann, *Aussereuropaische zweiflügelige Insekten*, v. 1, pp. 124–125, 1828; Osten Sacken, *Mem. Boston Soc. Nat. Hist.* 2 (pt. 4, No. 4): 430–431, 1876; *Smithsn. Misc. Collect.* No. 270, p. 228, 1878; Philip, *Bull. Brooklyn Ent. Soc.* 31: 195, 1936.

? *Tabanus fusconervosus* Macquart, *Diptères exotiques nouveaux ou peu connus*, v. 1, pt. 1, p. 147, 1838.

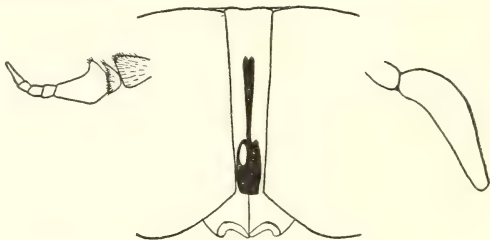


FIGURE 52.—Antenna, front view of head, and palpus of *Tabanus turbidus*.

Rather large; brown, with an indistinct median row of pale triangles on abdomen; wing veins more or less margined with brown and a spot at furcation; fore and hind tibiae uniformly brownish, with brown hair; antenna entirely reddish brown; frons very narrow and widened above; cell  $R_5$  wide open.

*Female*.—Length 20–22 mm. Eye bare, purple, with two green stripes. Frons brown, darker in region of median callus, about six times as high as width at base, distinctly widened above; basal and median calli reddish brown, the two forming a denuded stripe reaching two-thirds to three-fourths length of frons, and equal in width to narrowest part of front, except slightly below middle, where it is constricted; subcallus brown, the clypeus and genae slightly paler, with orange-brown hair. Antenna uniformly orange brown; first segment distinctly widened apically; second with a slender dorsal process; both with con-



colorous hair; third rather wide at base, with a short, sharp, dorsal angle but scarcely any excision; annulate portion slender, nearly equal in length to basal portion, the divisions distinct. Second palpal segment orange brown, with short black hair, moderate in length and thickness.

Mesoscutum reddish brown, with very faint pale stripes. Rest of thorax, legs, and abdomen orange brown. Abdomen often with a median row of faint pale triangles. Wing faintly tinged with yellowish brown, the costal cell distinctly so; cross veins and furcation, and sometimes all veins, faintly margined with brown; venation normal. Hind tibial fringe short and concolorous with tibia.

*Male*.—A somewhat teneral specimen of what is probably this species has been seen by the writer, but its condition is not satisfactory for description.

*Type*.—Female, in the Vienna Museum.

*Type locality*.—Kentucky.

*Distribution*.—Kentucky and North Carolina to Georgia and Florida. April 30 (St. Cloud, Fla.), to September 1 (Okefenokee Swamp, Ga.). In the United States National Museum, 10 females.

The original description of *Tabanus fusconervosus* Macquart gives no locality, but Walker (21) had it from Florida. Osten Sacken suggested that it might be the same as *turbidus*, but the description is too brief to make determination possible.

Fairchild informs the writer that this species is strictly nocturnal, he having collected it as late as 1 a. m. at light and feeding on cattle.

#### TABANUS EQUALIS Hine

(Fig. 53)

*Tabanus equalis* Hine, Ohio Jour. Sci. 23: 205, 1923.

*Tabanus uniformis* Hine, Ohio Jour. Sci. 17: 270, 1917. (Preoccupied by *Tabanus uniformis* Ricardo.)

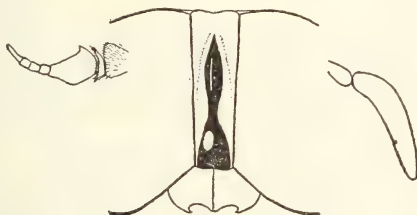


FIGURE 53.—Antenna, front view of head, and palpus of *Tabanus equalis*.

Rather large; grayish brown, with a median row of gray spots the length of the abdomen; a rather distinct spot at furcation; fore tibia uniformly brown.

*Female*.—Length 17–22 mm. Eye bare, dark purple, with two green bands. Frons about four and one-half times as high as width at base, somewhat widened above, with a distinct yellowish patch around median callus; basal and median calli reddish brown, the basal callus higher than wide, usually not quite touching eyes and narrowly joined to median callus, which is longer and more slender; subcallus and top of genae pale yellowish; clypeus and rest of genae gray, with nearly white hair. First and second antennal segments dark reddish, with black hair; first somewhat widened apically; second with a slender dorsal process; third with a distinct dorsal angle and moderate dorsal excision, usually black, with a hind margin of orange brown running from dorsal angle around to middle of basal portion ventrally; annulate portion dark brown to black, nearly as long as basal portion, the divisions distinct. Palpus moderate in length and thickness, pale reddish or yellowish brown, with short black hair.

Mesoscutum dark reddish, with yellowish pollinose stripes in the usual pattern; scutellum with a mixture of black and white hair. Pleura and sternum pale reddish, with pale hair. Wing hyaline, the cross veins and furcation faintly

marginated with brown; venation normal. Legs nearly uniformly reddish, with nearly white hair; hind tibial fringe entirely pale yellowish.

Abdomen reddish brown, with a median row of distinct, pale triangles, about equal in size on tergites 2-4 and progressively smaller posteriorly; lateral posterior margins each with a narrow yellowish band; venter nearly uniformly reddish, with pale pollen.

*Male*.—Areas of large and small facets of eye distinctly differentiated, the large facets covering about two-thirds of eye. Coloration as in female.

*Type*.—Female, in the collection of Ohio State University. The allotype male is also in that collection.

*Type locality*.—Jackson County, Kans.

*Distribution*.—From Iowa south to Oklahoma and Alabama. May 1 (Imboden, Ark.) to July 4 (St. Louis, Mo.). In the United States National Museum, 22 females, 8 males.

#### TABANUS SULCIFRONS Macquart

(Fig. 54, A)

*Tabanus variegatus* Fabricius, *Systema Antliatorum*, p. 95, 1805; Wiedemann, *Aussereuropaische zweiflügelige Insekten*, v. 1, pp. 120-121, 1828; Osten Sacken, *Smithsn. Misc. Collect. No. 270*, p. 228, 1878; Hine, *Ohio State Acad. Sci. Spec. Papers 5*: 56, 1903. (Preoccupied by *Tabanus variegatus* Degeer.)

*Tabanus sulcifrons* Macquart, *Diptères exotiques nouveaux ou peu connus*, sup. 5, p. 53, 1855; Osten Sacken, *Smithsn. Misc. Collect. No. 270*, p. 228, 1878; Williston, *Kans. Acad. Sci. Trans. 10*: 138, 1887; Hine, *Ohio State Acad. Sci. Spec. Papers 5*: 54-55, 1903; U. S. Dept. Agr., *Bur. Ent. Tech. Ser. 12*: 22-28, 1906; La. Agr. Expt. Sta. *Bull. 93*: 56, 1907; McAtee and Walton, *Ent. Soc. Wash. Proc. 20*: 204-205, 1918; Davis, *Ill. State Nat. Hist. Survey Bull. 13*: 97-99, 1919; Schwardt, *Ark. Agr. Expt. Sta. Bull. 332*: 51-54, 1936.

*Tabanus tectus* Osten Sacken, *Mem. Boston Soc. Nat. Hist. 2* (pt. 4, No. 4, and sup.): 436-437, 558, 1876-78.

*Tabanus exul* Osten Sacken, *Mem. Boston Soc. Nat. Hist. 2* (sup.): 558, 1878; Williston, *Kans. Acad. Sci. Trans. 10*: 138, 1887; Townsend, *Amer. Ent. Soc. Trans. 22*: 60, 1895; Hine, *La. Agr. Expt. Sta. Bull. 93*: 48, 1907; Garman, *Ky. Agr. Expt. Sta. Bull. 151*, 1910.

Rather large; orange brown, with a median row of white or yellowish triangles on abdomen; furcation and cross veins margined with brown; fore tibia bicolored; frons moderately wide; cell  $R_2$  usually open.

*Female*.—Length 18-23 mm. Eye blue, with two diagonal green bands, the lower one turning sharply upward at outer margin and nearly touching upper one, which is constricted at outer third. Frons yellowish gray, about four times as high as width at base, slightly widened above; basal callus shiny chestnut brown, nearly twice as high as width below where it touches the eyes, and slightly narrowed above; median callus narrow, about length of basal callus and joined to it by a slender line: subcallus, clypeus, and genae light gray tinged with yellow, the hair below yellowish white. First two antennal segments dark orange brown, with black hair; basal portion of third orange, often darkened beyond dorsal angle, the annulate portion black; dorsal angle right or slightly acute, the dorsal excision deep; annulate portion slightly shorter than basal portion. Second palpal segment rather slender, tapering, orange brown, with short black hair.

Mesonotum dark reddish brown, with yellowish-gray lines in usual pattern; prescutal lobe orange brown, with black hair; tufts of yellowish hair above and below wing base and on side of scutellum. Pleura, sternum, and coxae gray tinged with reddish and with pale-yellowish hair except for black hair on supraepimera. Wing subhyaline tinged with orange, or sometimes grayish discally, the costal cell orange and cross veins and furcation margined with brown; cell  $R_2$  narrowed apically, but only very rarely closed at margin. Fore femur black; middle and hind femora dark brown, with yellowish-brown apices; fore tibia with basal half yellowish brown, with pale hair, apical half dark brown, with black hair; middle and hind tibiae orange brown, darker

apically; hind tibial fringe entirely black; tarsi dark orange brown to black, the fore tarsus darkest.

Abdomen above orange brown, somewhat darkened apically; a median row of white or yellowish triangles on tergites 1-5 or 6; on tergite 2, at least, usually a median black spot in front of triangle; hind margins of tergites with narrow yellow bands, slightly widened laterally; venter orange brown, with paler incisures and sometimes the sternites blackened along anterior margin.

*Male*.—Area of large and small facets of eye distinctly differentiated, the extent of the large facets somewhat variable but usually covering little more than half of eye and with a rather broad band of small facets along hind margin. Second palpal segment nearly black, truncate apically. Pale hair of body more yellowish, with relatively little pale hair on legs. Fore tibia only slightly paler basally. Coloration of rest of body essentially as in female, the abdominal triangles varying considerably in size.

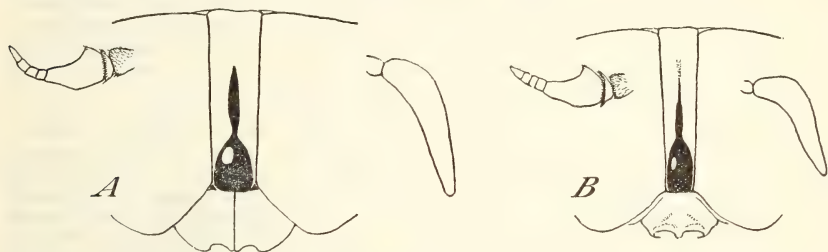


FIGURE 54.—Antenna, front view of head, and palpus of (A) *Tabanus sulcifrons* and (B) *T. abdominalis*.

*Type*.—Female, originally in the Bigot collection, perhaps now in the British Museum.

*Type locality*.—Baltimore.

*Distribution*.—Iowa to New York and south to Oklahoma and Florida. May 10 (Columbus, Ohio) to November 15 (Baton Rouge, La.). In the United States National Museum, 266 females, 70 males.

For many years *Tabanus sulcifrons*, *T. exul*, and *T. variegatus* have been considered to be distinct species or, in the case of *exul* at least, synonymous with *abdominalis* Fabricius. As pointed out under the latter species, *abdominalis* is quite distinct and should not be confused. This leaves a somewhat variable species, divided by Osten Sacken into three. One, which he described and named *Tabanus tectus*, he later found to be a synonym of *T. sulcifrons* Macquart, after studying the type of the latter. In this the abdominal triangles are large and broad and the large facets in the eye of the male are reduced in number, occupying only the upper portion of the eye. Another, described by Osten Sacken and named *T. exul*, has small abdominal triangles and a more extensive area of large facets in the male eye. The third, *T. variegatus* F., has the discal portion of the wing distinctly whitish. The writer has studied a large number of this species, involving both sexes of all three forms, and cannot see that any of the above-mentioned characters are sufficient even to differentiate varieties or races. They do not sort out geographically, and intergrade so completely in any given area that there appears no excuse for separating them.

This is the commonest horsefly in the vicinity of Washington, D. C., in midsummer and early in the fall. Garman, under the name of *T. exul*, described a serious outbreak of them in Kentucky in 1910.



## TABANUS ABDOMINALIS Fabricius

(Fig. 54, B)

*Tabanus abdominalis* Fabricius, Systema Antliatorum, p. 96, 1805; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4, and sup.): 434-436, 557-558, 1876-78; Smithsn. Misc. Collect. No. 270, p. 227, 1878; McAtee and Walton, Ent. Soc. Wash. Proc. 20: 204, 1918.

Rather large; orange brown, the abdomen with a row of subquadrate, dark, median spots, occasionally with a pale triangle behind each one; wing spotted with brown; fore tibia bicolored; frons narrow; cell  $R_5$  nearly or quite closed.

*Female*.—Length 19-22 mm. Eye bare, purple, with two green bands. Head yellowish gray. Frons very narrow, its height at least five times width across basal callus, slightly widened above; basal callus dark brown, higher than wide, touching eyes at base only and gradually tapering to a slender median callus reaching to upper third of frons; vertex gray, with short black hair. First two antennal segments dark orange brown, with short black hair; third orange, the annulate portion sometimes darker; dorsal angle prominent, rectangular, the dorsal excision pronounced; length of annulate portion about two-thirds that of basal portion. Hair of clypeus and genae pale yellowish. Second palpal segment of moderate length and thickness, tapering to a narrow apex, orange brown to black, densely clothed with short black hair.

Mesoscutum nearly black, with yellowish lines in usual pattern; prescutal lobe with dense fringe of black hair; yellowish hair around wing base; scutellum black, with a lighter margin and yellowish hair. Pleura, sternum, and coxae yellowish gray, with pale-yellow hair. Wing dilute orange brown, paler posteriorly and in center of cells; cross veins faintly margined with brown and furcation with a distinct brown spot; cell  $R_5$  nearly or quite closed. Femora black, with concolorous hair; tibiae orange, except apical half or more of fore tibia and apical fourths of middle and hind tibiae, which are black or very dark orange; hair concolorous with part from which it arises, including the well developed hind tibial fringe; tarsi dark brown to black.

Abdomen above orange, usually with a median row of black spots on anterior margins of tergites; spot on tergite 2 narrow, reaching to center; those on tergites 3-7 progressively longer and wider; there may be indications of pale triangles posteriorly to these dark spots, but they may be wholly lacking in well preserved specimens; venter orange, the posterior sternites darker, with orange hind margins.

*Male*.—Unknown.

*Cotypes*.—Two females in the museum of the Jardin des Plantes, Paris.

*Type locality*.—Carolina.

*Distribution*.—Connecticut to Florida and west to Oklahoma and Texas. June 15 (Beaumont, Tex.) to August 24 (Imboden, Ark.). In the United States National Museum, 16 females.

The original description of this species is scarcely recognizable, but the identity was established by Osten Sacken and the type specimens discussed by him. McAtee and Walton stated that the character of the closed cell  $R_5$  was not sufficient to separate this species from *sulcifrons* Macquart, and that since the species was described from females the character of the eye in the male cannot be used. This is true, but other characters mentioned by Osten Sacken, such as the width of the frons and the color of the abdomen, will separate this species from its relatives. Since Osten Sacken examined the types the writer assumes that his determination of the species is correct.

## TABANUS ACUTUS (Bigot)

(Fig. 55, A)

*Atylotus acutus* Bigot, Mem. Soc. Zool. France 5: 660, 1892.*Tabanus acutus* Hine, Ohio Nat. 7: 22, 1906; La. Agr. Expt. Sta. Bull. 93: 40-41, 1907.

Medium sized, slender; yellowish brown, with a broad, pale, parallel-sided, median stripe on abdomen; a small infuscation at furcation.

*Female*.—Length 16-19 mm. Eye bare, green, with three diagonal purple bands, the lower one considerably wider than the upper two. Frons about three and one-half times as high as width at callus, very slightly widened above, yellowish brown, usually with a darker patch medianly; basal callus dark, shiny brown, higher than wide, not touching eyes, and tapering to a slender median callus; subcallus rich orange brown, the clypeus and genae grayer, with some sparse whitish hair. Antenna uniformly orange, the first two segments with black hair; basal portion of third segment rather stout, the dorsal angle with a short, forward-projecting process. Second palpal segment rather long and slender, orange brown, with short black hair.



FIGURE 55.—Antenna, front view of head, and palpus of (A) *Tabanus acutus* and (B) *T. vicarius*.

Thorax yellowish brown, the dorsum darkest, with five faint, slender, pale stripes. Wing pale orange brown, the costal cell and spot at furcation somewhat darker than rest; cell  $R_5$  somewhat narrowed apically. Legs yellowish brown, the tarsi and apex of fore tibia somewhat darker.

Abdomen, above orange brown, somewhat darker at apex, with a rather broad, parallel-sided, pale-yellowish-brown, median stripe the entire length; venter nearly uniformly orange brown.

*Male*.—Areas of large and small facets of eye sharply differentiated, the former extensive, reaching to hind margin and half way down on frontal triangle. Second palpal segment with pale hair only, stout, with an acute, decurved apex. Rest of coloration essentially as in female.

*Type*.—Female, perhaps in British Museum.

*Type locality*.—North America (New Orleans).

*Distribution*.—The Mississippi Delta district at New Orleans and below and at mouths of the Apalachicola and Withlacoochee Rivers, Fla. May 19 (New Orleans, La.) to August 25 (Johnson's Bayou, La.). In the United States National Museum, 11 females, 2 males.

## TABANUS VICARIUS Walker

(Fig. 55, B)

*Tabanus costalis* Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, pp. 173-174, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 450-451, 1876; Hart, Ill. State Lab. Nat. Hist. Bull. 4: 236-238, 1895; Hine, Ohio State Acad. Sci. Spec. Papers 5: 50, 1903; Ohio Nat. 7: 24, 1906; La. Agr. Expt. Sta. Bull. 93: 46-47, 1907; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 104-105, 1931; Schwardt, Ark. Agr. Expt. Sta. Bull. 332: 35-38, 1936. (Preoccupied by *Tabanus costalis* Lichtenstein.)

*Tabanus vicarius* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 187, 1848; Stone, Ent. Soc. Wash. Proc. 37: 18, 1935.

*Tabanus baltimorensis* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 5 pp. 64-65, 1855.

*Tabanus floridanus* Szilady, Biologica Hungarica, v. 1, fasc. 7, p. 24, 1926. (New synonymy.)

Rather small; yellowish, with a median, parallel-sided stripe on abdomen, bordered by blackish; costal cell yellow; pleura and palpus strongly tinged with yellow.

*Female*.—Length 11-13 mm. Eye bare, green, with one diagonal purple band. Frons yellow, about four times as high as width at base, with parallel sides or almost imperceptibly widened above; basal callus shiny black, square or slightly higher than wide, not touching eyes; median callus small, lanceolate, black, usually narrowly joined to basal callus; subcallus and extreme top of genae yellow. Antenna slender, orange brown, the annulate portion dark brown to black; first two segments with black hair; basal portion of third slender, but with a distinct dorsal angle and only a shallow excision; annulate portion rather stout, equal to or slightly longer than basal portion. Clypeus and lower genae yellowish gray, with yellowish hair. Second palpal segment moderate in size, slightly swollen at base, yellowish, with rather long, concolorous hair near base and short black hair.

Mesonotum dark brown, with yellow pollen, erect black hair, and recumbent yellow hair; no indication of stripes. Pleura, sternum, and coxae gray, strongly suffused with yellow, with pale-yellow hair. Wing hyaline, the costal cell rather intensely yellow. Coxae and femora yellowish olive, with yellow hair; tibiae orange yellow, the apical half of fore tibia, apex of hind tibia, and tarsi black.

Abdomen above variable in color but always with a median stripe of pale-yellow pollen and hair the entire length; rest of dorsum nearly black except for a lateral patch of yellow orange, narrowing apically, on tergites 1-3 or 1-4; venter yellowish orange, darker apically.

*Male*.—Areas of large and small facets of eye sharply differentiated, the former yellow or brown in dried specimens, the latter black. Coloration throughout similar to that of female, the hair longer and the abdomen with less black.

*Cotypes*.—Three specimens mentioned in the original description, from Honduras, Massachusetts, and North America. According to John Smart of the British Museum, the specimen from Honduras cannot be found, and the specimen from Massachusetts does not bear a type label.

*Type locality*.—North America.

*Distribution*.—Colorado to Michigan and Quebec and south to Arkansas and Florida. June 1 (Monroe County, Mich.) to September 10 (Falls Church, Va.). In the United States National Museum, 120 females, 40 males.

The writer's acceptance of the name *vicarius* Walker for the species which has gone for so many years under the invalid name of *Tabanus costalis* Wiedemann is based upon the following facts: (1) The name has been placed as a synonym of *costalis* for many years and is apparently the first available synonym. (2) Hine examined the type of *vicarius* and a specimen compared by him with the type is *costalis* Wiedemann; (3) specimens of both *costalis* Wiedemann and *nigrovittatus* Macquart were sent to John Smart, who compared them with the two specimens of *vicarius*. The North American specimen was found to agree very closely with the *costalis* which was sent. The Massachusetts specimen apparently agrees more nearly with *nigrovittatus*.



## TABANUS CAYENSIS Fairchild

(Fig. 56, A)

*Tabanus cayensis* Fairchild, Florida Ent. 18: 53-54, 1935.

Small; abdomen above with a parallel-sided, gray, median stripe superimposed on a broader black stripe; costal cell brown; frons very broad.

*Female*.—Length 9 mm. Eye bare, greenish, with a single, diagonal, purplish band. Frons grayish, about two and one-half times as high as wide, with parallel sides; basal callus shiny chestnut brown, about as high as wide; median callus oval, narrowly connected with basal callus; vertex bare, flat, the denuded area running down eye margin a short distance and connected medianly with median callus; subcallus grayish. First two antennal segments yellowish brown, with black hair; basal portion of third orange, darkened apically, the annulate portion black; basal portion slender, with a short, obtuse, dorsal angle; annulate portion nearly as long as basal portion. Second palpal segment white, with scattered black hair, scarcely swollen basally and with rather blunt apex.



FIGURE 56.—Front view of head and palpus of (A) *Tabanus cayensis* and antenna, front view of head, and palpus of (B) *T. fuscicostatus* and (C) *T. nigrovittatus*.

Mesonotum black, with grayish pollen, the humeral and prescutal lobes yellowish brown. Pleura, sternum, and coxae gray tinged with brown. Wing subhyaline, the veins narrowly margined with brown and costal cell distinctly brown. Legs blackish except the yellowish basal half of fore tibia and all of middle and hind tibiae.

Abdomen above dark grayish, with a rather broad, gray, median stripe, large yellowish spots sublaterally on tergites 1-4, those anteriorly reaching to sides of tergites and contiguous with one another, and narrow, yellowish, posterior bands; venter yellowish basally, darker apically.

*Male*.—Unknown.

*Type*.—Female, Museum of Comparative Zoology No. 20134. Paratype, United States National Museum No. 50803.

*Type locality*.—Stock Island, near Key West, Fla.

*Distribution*.—Monroe County, Fla., July 1. In the United States National Museum, one female.

## TABANUS FUSCICOSTATUS Hine

(Fig. 56, B)

*Tabanus fuscicostatus* Hine, Ohio Nat. 7: 24, 1906; La. Agr. Expt. Sta. Bull. 93: 49-50, 1907.

Rather small; brown, with a pale dorsal stripe and usually faint sublateral spots on abdomen; costal cell dark.

*Female*.—Length 10-13 mm. Eye bare, green, with a single, diagonal, purple band. Frons three and one-half to four times as high as wide, nearly parallel sided, yellowish brown; basal callus shiny yellowish brown, square or slightly higher than wide, narrowly separated from eyes; median callus small, wrinkled, rarely joined narrowly to basal callus; subcallus concolorous with frons. First two antennal segments yellowish, with black hair; third orange, the annulate portion slightly darker; dorsal angle obtuse and excision shallow; annulate portion slightly longer than basal portion. Clypeus and genae whitish, with white hair. Second palpal segment slightly swollen basally, creamy white, with a mixture of black and concolorous hair.

Mesonotum blackish brown, with brownish-gray lines in usual pattern; rest of thorax gray, with whitish hair. Wing hyaline, the costal cell and stigma brown; veins brown, the venation normal. Legs yellowish brown, the apical half of fore tibia and the tarsi darker; hind tibial fringe black.

Abdomen above dark brown, with a median, parallel-sided stripe of yellowish brown and usually small sublateral spots of the same color; venter yellowish brown, dusky apically.

*Male*.—Unknown.

*Cotypes*.—Females, in the collection of Ohio State University and probably in the United States National Museum.

*Type locality*.—Baton Rouge, La.

*Distribution*.—South Carolina to Louisiana. June 6 (Opelousas, La.) to August 3 (Tallulah, La.). In the United States National Museum, 14 females.

#### TABANUS NIGROVITTATUS Macquart

(Fig. 56, C)

*Tabanus nigrovittatus* Macquart, *Diptères exotiques nouveaux ou peu connus*, sup. 2, pp. 40–41, 1847; Osten Sacken, *Mem. Boston Soc. Nat. Hist.* 2 (pt. 4, No. 4): 449–450, 1876; Hine, *Ohio Nat.* 7: 25–26, 1906; *La. Agr. Expt. Sta. Bull.* 93: 53–54, 1907.

*Tabanus simulans* Walker, *List of the Specimens of Dipterous Insects in the Collection of the British Museum*, pt. 1, p. 182, 1848. (New synonymy.)

*Tabanus conterminus* Walker, *Insecta Saundersiana*, *Diptera*, v. 1, pp. 24–25, 1850.

? *Tabanus allynii* Marten, *Canad. Ent.* 15: 110–111, 1883.

Rather small; abdomen yellowish sublaterally, with a pale median stripe; eye with a single purple band; costal cell dilute yellow; clypeus, genae, and palpus tinged faintly, if at all, with yellow; frons with nearly parallel sides; third antennal segment with annulate portion longer than basal portion.

*Female*.—Length 9–14 mm. Eye bare, green, with one purple band. Frons yellowish gray, slightly over three times as high as width at base, only slightly widened above; basal callus shiny black, subquadrate; median callus a short, slender line, often extremely narrow and separated from basal callus; vertex pollinose, smooth; subcallus and top of genae concolorous with frons. First two antennal segments yellowish brown, with black hair; third orange, darkened apically, the dorsal angle distinct, obtuse, the dorsal excision moderate; annulate portion usually slightly longer than basal portion. Clypeus and lower genae gray, with white hair. Palpus whitish; the second segment with white and some scattered black hair and moderately swollen at base, strongly tapering apically.

Mesonotum gray to grayish yellow, with erect black hair and recumbent yellowish hair and little if any indication of stripes; prescutal lobe concolorous with rest of mesonotum or tinged with yellow brown. Pleura, sternum, and coxae gray, weakly tinged with yellow. Wing hyaline, the costal cell pale yellow; venation normal. Femora gray tinged with yellow, the apices somewhat orange brown; tibiae yellow brown, the apical half of fore tibia nearly black and extreme apices of others slightly darkened; tarsi dark brown to black.

Abdomen above yellowish brown, with a dark-brown to black, rather broad, median stripe and a narrow, lateral, dark-brown stripe, evanescent anteriorly; on the median dark stripe lies a narrow, parallel-sided, pale grayish-yellow stripe; the yellowish-brown area between the median and lateral darker areas may be in the form of distinct, somewhat oblique spots, or these spots may be so enlarged and confluent that definite spots are lacking; rubbed specimens may superficially resemble *Tabanus daeckei* and related species; venter yellow brown, somewhat darkened apically and medianly.

*Male*.—Areas of large and small facets of eye strongly differentiated, the large facets often rather widely separated from top of eye by a band of small facets. Palpus moderately stout, with an acute, usually decurved apex. Coloration essentially as in female, the fore tibia less distinctly bicolored.

*Type*.—Female, collection unknown.

*Type locality*.—Nova Scotia.

*Distribution*.—Coast from Nova Scotia to Texas. April 21 (Wakulla County, Fla.) to November 23 (Hillsboro County, Fla.). In the United States National Museum, 432 females, 12 males.

Hine (4) recognized *conterminus* as a valid species, separated from *nigrovittatus* by its somewhat greater length, grayer mesonotum not tinged by yellow, and the greater extension of the large facets of the eye in the male, these attaining the hind margin. The writer has examined over 500 specimens and admits that there is some basis for this separation, at least with varietal status. However, there are so many doubtful specimens, possessing characters of both forms, that it does not seem advisable to separate them. The writer has seen specimens compared by Hine with the types of *conterminus* and *simulans* and these specimens were conspecific and collected at the same place. Therefore, if a varietal rank were to be given to the larger, grayer form, it must be known as *simulans*, the older name. The type of *Tabanus allynii* Marten is probably lost and it is not clearly recognizable from the description. Certain rubbed specimens of *nigrovittatus* come nearer to fitting the description than any other species the writer knows.

This species is close to *vicarius* Walker, and the yellower specimens are often difficult to distinguish from *vicarius*. It is quite evident that *nigrovittatus* requires salt-marsh or brackish water in which to breed, whereas *vicarius* breeds in fresh water.

#### TABANUS MULARIS Stone

(Fig. 57, A)

*Tabanus mularis* Stone, Ent. Soc. Wash. Proc. 37: 15, 1935.

Small; mesonotum grayish green; abdomen blackish, with a pale, median, dorsal stripe; costal cell orange brown; palpus creamy white.



FIGURE 57.—Antenna, front view of head, and palpus of (A) *Tabanus mularis* and (B) *T. lineola*.

*Female*.—Length 10–12 mm. Eye bare, green, with a single, diagonal, purple band. Frons yellowish, about four times as high as width at basal callus, with nearly parallel sides; basal callus dark brown to black, slightly higher than wide and narrowly separated from eyes; median callus small and usually separated from basal callus; subcallus and genae above level of antennae, concolorous with frons; rest of genae and clypeus gray, faintly tinged with yellow. First two antennal segments reddish brown, with rather dense, short, black hair, the first with some grayish pollen; third orange brown, the annulate portion slightly darker; basal portion with a distinct dorsal angle but only a slight dorsal excision; annulate portion slightly longer than basal portion. Second palpal segment moderately thick basally and tapering to a slender apex, pale cream colored, with black hair.

Mesonotum olive green, unstriped; the remainder gray, faintly tinged with olive green. Wing hyaline, the costal cell orange brown; venation normal. Femora black, with greenish-gray pollen; tibiae yellow, the apical two-thirds of fore tibia and apices of others black; tarsi black.

Abdomen black, with a light-yellowish-gray median stripe and an indication of faint sublateral stripes; venter olive green, sometimes quite dark.

*Male*.—Areas of large and small facets sharply differentiated, the former extensive; in dried specimens the large facets yellow, the small facets black; palpus rather slender, with acute apex. Body coloration essentially as in female.



The male described from a specimen in the United States National Museum from Washington County, Ark., June 22, 1927 (D. G. Hall).

*Type*.—Female, United States National Museum No. 50618. Paratypes, 17 female specimens in the United States National Museum, No. 50618.

*Type locality*.—Baton Rouge, La.

*Distribution*.—Southeastern part of the United States from Maryland to Florida and west to Oklahoma. April 30 (St. Cloud, Fla.) to November 23 (Hillsboro County, Fla.). In the United States National Museum, 48 females, 5 males.

#### TABANUS LINEOLA Fabricius

(Fig. 57, B)

*Tabanus lineola* Fabricius, Entomologia Systematica, v. 4, pp. 369–370, 1794; Coquebert, Illustratio Iconographica Insectorum, p. 112, pl. 25, fig. 6, 1804; Wiedemann, Diptera Exotica, pt. 1, pp. 81–82, 1821; Aussereuropäische zweiflügelige Insekten, v. 1, pp. 170–171, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 448–449, 1876; Hine, Ohio Nat. 7: 25, 1906; La. Agr. Expt. Sta. Bull. 93: 50–51, 1907; Snyder, Ent. Soc. Wash. Proc. 18: 208, 1916; Schwardt, Ark. Agr. Expt. Sta. Bull. 332: 41–47, 1936.

*Tabanus commixtus* Walker, Ent. Soc. London Trans. 5: 273–274, 1860.

*Tabanus compactus* Aldrich, Smithsn. Misc. Collect. No. 1444, p. 204, 1905. (Misspelling for *commixtus* Walker.)

*Tabanus quinquemaculatus* Hine, U. S. Dept. Agr., Div. Ent. Bull. 44: 58, 1904. (Misspelling for *quinquerittatus* Wiedemann.)

*Tabanus quinquerittatus* Hine (not Wiedemann?), Ohio Nat. 7: 26, 1906; La. Agr. Expt. Bull. 93: 55–56, 1907.

Rather small; yellowish brown to blackish, with three rows of yellowish-gray spots on abdomen, the median spots, at least, forming a parallel-sided stripe; frons widened above; wing, including costal cell, hyaline.

*Female*.—Length 10–15 mm. Eye bare, purple, with a broad, diagonal, green stripe from inner angle to near outer margin, slightly turned upward outwardly, and a V-shaped mark above the apex near end of lower band, the lower arm from top of basal callus, the upper arm broader, parallel to upper margin of eye and about its own width from margin. Frons yellowish gray, slightly over four to five times as high as width at base, distinctly widened above; basal callus dark brown to black, square or slightly higher than wide, not quite touching eyes; median callus a slender, often lanceolate, concolorous streak, about as long as basal callus and usually joined to it; subcallus and top of genae concolorous with frons, the subcallus often somewhat denuded on lower half. Antenna orange, the first two segments with black hair; third with a distinct dorsal angle and shallow excision; annulate portion usually slightly shorter than basal portion. Clypeus and lower genae white, with white hair. Palpus creamy white, with mixed black and white hair, the second segment moderately swollen basally and tapering to a rather slender apex.

Mesonotum gray, with erect black hair and recumbent pale-yellowish hair; a faint indication of stripes in the usual pattern; prescutal lobe distinctly reddish. Pleura, sternum, and coxae gray, with white hair, the tufts under wing base tinged with yellowish. Wing hyaline, including costal cell, the veins dark brown. Femora gray, with pale hair, the apices of middle and hind femora yellowish; tibiae yellowish, with concolorous hair, except black apical half of fore tibia and some black hair on hind tibia forming a sparse fringe; tarsi dark orange brown to black, the fore tarsus darkest.

Abdomen above brownish black, with a median, parallel-sided, yellowish or whitish stripe and, at each side, a row of sublateral, more or less sharply defined spots, contiguous with one another and either somewhat oblique to form an irregular stripe or quite regular; venter yellowish brown, with some blackish apically.

*Male*.—Areas of large and small facets sharply differentiated, the large facets extensive and upper surface of head distinctly flattened. Body coloration essentially as in female, the darker portion of abdomen not quite so dark.

*Type*.—Female; collection unknown, originally in “Mus. Dom. Bosc.”

*Type locality*.—“America boreali.”

*Distribution*.—Atlantic States from Maine to Florida and Gulf States to Texas. February 11 (Paradise Key, Fla.) to October 15 (Galveston, Tex.). In the United States National Museum, 363 females, 24 males.

Kröber (10, p. 344; 11, p. 293) recognized as *Tabanus lineola* Fabricius a well known Neotropical species which has hitherto been called *T. trivittatus* Fabricius or *T. trilineatus* Latreille. While the original description of *T. lineola* or Coquebert's illustration is not sufficient to make determination positive, the fact that the type locality is North America prevents the name from being applied to a strictly Neotropical form, as Kröber has done. In the abundant material of this group from South America and Central America the writer has not found the Nearctic species described here nor has he seen the species called *lineola* by Kröber in the Nearctic region. It is reasonable to suppose, as Osten Sacken did, that Fabricius had the species here described, since it agrees well with the Coquebert figure and is one of our commonest species.

Hine recognized as *Tabanus quinquevittatus* Wiedemann specimens which the writer has studied and which appear to be no more than specimens of *lineola* with the blackish-brown color reduced and the yellowish brown more extensive. In these specimens, principally from Louisiana and Texas, there is a decided tendency for the frons to be slightly wider, the sublateral pale stripes of the abdomen slightly straighter, and little if any black hair on the sixth sternite. It is possible that this might be given varietal status, but very questionable that it is the same as *T. quinquevittatus* Wiedemann (p. 167).

#### TABANUS LINEOLA variety SCUTELLARIS Walker

*Tabanus scutellaris* Walker, Insecta Saundersiana, Diptera, v. 1, pp. 27–28, 1850.

*Tabanus lineola* Hart, Ill. State Lab. Nat. Hist. Bull. 4: 235–236, 1895; Hine, Ohio State Acad. Sci. Spec. Papers 5: 51–52, 1903; Ohio Nat. 5: 240, 1904; Schwardt, Ann. Ent. Soc. Amer. 24: 409–416, 1931; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 32, 109, 1931; Rowe and Knowlton, Canad. Ent. 67: 242–243, 1935.

*Female and male*.—This variety differs from the typical form in having the posterior half of the scutellum reddish brown. It is the common inland form.

*Type*.—Female, probably in Hope Museum, Oxford.

*Type locality*.—“Bolton, North America.”

*Distribution*.—British Columbia to Ontario and Massachusetts and south to Arizona, Louisiana, and Georgia. March 3 (Dallas, Tex.) to September 22 (Medora, Kans.). In the United States National Museum, 131 females, 38 males.

#### TABANUS TRUQUII Bellardi

(Fig. 58, A)

*Tabanus truquii* Bellardi, Saggio ditterologia messicana, pt. 1, pp. 64–65, 1859; Hine, Ohio Nat. 7: 28, 1906.

Rather small; abdomen with a median white stripe; wing hyaline; eye pilose; palpus not unusually slender.

*Female*.—Length 14 mm. Eye with sparse, short pile. Frons yellowish gray, with black hair, somewhat browner across middle, about four times as high as wide, with parallel sides; basal callus orange brown, subquadrate, not

touching eyes or lower margin of frons; median callus a very slender line from basal callus of about same length; subcallus and upper genae concolorous with frons, the latter with black hair. First antennal segment yellowish brown, with black hair, the dorsal, apical angle somewhat enlarged; second orange brown, with a distinct dorsal process; third orange, the annulate portion slightly darkened; dorsal angle about right and excision rather deep; annulate portion shorter than basal portion. Clypeus and lower genae white, with white hair. Palpus creamy white; second segment slightly swollen basally, tapering to a blunt apex, with short black hair.

Mesonotum olive brown, with erect black hair and recumbent whitish hair; prescutal lobe somewhat reddened. Pleura, sternum, and coxae gray, with white hair. Wing hyaline; cell  $R_5$  slightly narrowed apically. Femora reddish, somewhat grayed basally and fore femur darker, with black hair; tibiae yellowish, the fore tibia slightly enlarged and apical half black; hind tibial fringe distinct, black; tarsi black to dark brown.



FIGURE 58.—Antenna, front view of head, and palpus of (A) *Tabanus truquii* and (B) *T. hinei*.

Abdomen above brown, with a pronounced, creamy-white, median stripe on tergites 1-6 and a concolorous sublateral stripe joined to median stripe at anterior margin of first tergite and breaking into spots beyond second tergite; extreme lateral margin white, with white hair; venter pale reddish, with a gray median stripe, widening posteriorly.

*Male*.—Eye distinctly pilose, areas of large and small facets rather distinctly differentiated and the former extensive; palpus stout, creamy white. Abdomen slightly more yellowish sublaterally than in female, the body coloration otherwise essentially the same.

*Type*.—Male, originally in the Bellardi collection.

*Type locality*.—Mexico.

*Distribution*.—Texas to Guatemala. February (Guatemala) to May 5 (Uvalde, Tex.). In the United States National Museum, one female, five males, all from Texas.

Kröber (9, p. 248) described what he believed to be *truquii* Bellardi from Brazil, later placing it as a possible synonym of *Tabanus occidentalis* Linnaeus. However, the species before him had bare eyes and a narrower frons, with the sides not parallel. This could not be Bellardi's species.

#### TABANUS HINEI Johnson

(Fig. 58, B)

*Therioplectes politus* Johnson, Ent. News 11: 325, 1900. (Not *Tabanus politus* Walker.)

*Tabanus hinei* Johnson, Psyche 11: 15, 1904.

Rather small; shiny black, with orange on side of abdomen; a cloud on wing in vicinity of stigma; palpus very thin, dark; subcallus denuded.

*Female*.—Length 10-13 mm. Eye with fine, distinct pile, purple, with four green stripes. Frons yellowish gray, about four times as high as width at base, with nearly parallel sides; vertex with a shiny-black triangle, its base resting on hind margin of head, the apex with a distinct, dark-reddish, ocellar tubercle; basal callus shiny black, rather convex, nearly square, and as wide as frons; median callus black, irregular in shape and joined to basal callus by a slender line; subcallus distinctly convex, shiny black. First two antennal segments not swollen above; third orange or reddish at base, dark at apex, the basal portion of moderate width and the dorsal angle very obtuse; annulate portion stout and black, somewhat shorter than basal portion. Clypeus and genae mostly shiny



black, with sparse yellowish or whitish hair. Second palpal segment dark brown to black, very slender and tapering.

Thorax mostly shiny black; prescutal lobe often yellowish or orange; mesonotum with sparse yellowish and black hair, the pleura with a considerable amount of yellow hair around wing base. Wing hyaline except for a brown costal cell and a faint tinge of brown between stigma and vein  $M_{1+2}$ . Legs black, the tibiae sometimes brownish.

Abdomen above shiny black, with yellowish-brown sublateral spots on tergites 1-3, often uniting to form a single area, and a row of small median triangles of yellowish hair; venter mostly black, with more or less yellowish basally and with hind margins of sternites with narrow bands of pale pollen and pile.

*Male*.—Eye densely brown pilose; large and small facets not greatly differing in size and the areas not sharply differentiated. Subcallus protuberant, with gray pollen. Otherwise as in female, but with more yellow brown on abdomen.

*Type*.—Male, in the Museum of Comparative Zoology, Cambridge, Mass.

*Type locality*.—Merchantville, N. J.

*Distribution*.—Southern shore of Lake Ontario; Atlantic coast from Massachusetts to Florida. May 27 (Dismal Swamp, Va.) to July 20 (Marblehead, Mass.). In the United States National Museum, nine females, nine males.

#### TABANUS HINEI variety WRIGHTI Whitney

*Tabanus wrighti* Whitney, Canad. Ent. 47: 380-381, 1915; Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8: 87-88, 1933.

*Female*.—This variety differs from the typical *wrighti* in that the antenna is almost entirely black, the wings more extensively infuscated and darker, and the yellowish spots on the abdomen much reduced. The writer does not believe that it deserves more than varietal status.

*Type*.—Female, Museum of Comparative Zoology No. 17061. Paratype females, Museum of Comparative Zoology No. 17061.

*Type locality*.—West Palm Beach, Fla.

*Distribution*.—North Carolina to Florida. May (West Palm Beach, Fla.) to June 2 (Dare County, N. C.).

#### TABANUS CINCTUS Fabricius

(Fig. 59, A)

*Tabanus cinctus* Fabricius, Entomologia Systematica, v. 4, p. 366, 1794; Wiedemann, Diptera Exotica, pt. 1, p. 67, 1821; Meigen, Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten, v. 2, p. 42, 1820; Harris, A Treatise on Some of the Insects Injurious to Vegetation, new ed., p. 602, fig. 261, 1862; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 464, 1876; Philip, Minn. Agr. Expt. Sta. Tech. Bul. 80: 104, 1931.

*Dasyommia cincta* Enderlein, Mitt. Zool. Mus. Berlin 10: 346, 1922; 11: 349, 1925; Kröber, Zool. Anz. 83: 57-58, 1929.

Rather large; black, with a broad band of orange across base of abdomen.

*Female*.—Length 19-22 mm. Eye bare or with very sparse pile, deep purple, with four bluish-green bands. Frons brown, about four times as high as width at base, slightly widened above, with black hair; basal callus subquadrate, not quite touching eyes, dark orange-brown to black; median callus black, rather broad; vertex with a black triangle on which are situated three longitudinally elongate, reddish-brown, ocellus-like protuberances; subcallus denuded medianly, orange brown, with a narrow border of brown pollen. Antenna orange brown, the annulate portion often black; first two segments with black hair, the first not enlarged; basal portion of third with a short but prominent dorsal angle near base, beyond base of which the dorsal surface is only slightly excised; annulate portion considerably shorter than basal portion. Clypeus and genae brown, with dark-brown to black hair, particularly around oral margin. Second palpal segment black, moderately elongate and slender, with blunt apex.

Thorax and legs dark brown to black, with concolorous hair, the humeral and prescutal lobes usually lighter. Wing smoky brown, the vein margins darker than discal part of cells.

Abdominal segments 1-3 yellow orange; on tergites 1 and 2 an indistinctly margined black triangle, its base under scutellum and its apex usually ending on tergite 2, but sometimes reaching onto or across tergite 3; a dark line along extreme lateral margin of these segments; segments 4-7 entirely black dorsally, but sternite 4 often with considerable orange.

*Male*.—Eye with dense, short pile. Head not enlarged, the line of differentiation between the areas of large and small facets imperceptible. Coloration of body as in female.

*Type*.—Collection unknown.

*Type locality*.—Virginia.

*Distribution*.—Manitoba and Colorado to Maine and south to Georgia in Atlantic States. June 19 (Aweme, Manitoba) to August 11 (Salisbury Cave, Maine). In the United States National Museum, 11 females, 9 males.

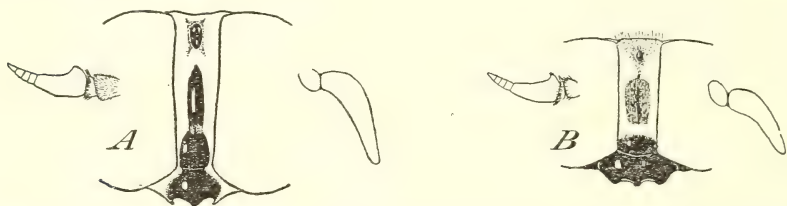


FIGURE 59.—Antenna, front view of head, and palpus of (A) *Tabanus cinctus* and (B) *T. carolinensis*.

This striking species is the type of the genus *Dasyommia* Enderlein. Although the eye of the female is bare or nearly so, and the ocellilike protuberances are more pronounced than usual, it does not seem that these characters are sufficient to warrant considering it as more than an unusual *Tabanus*.

#### TABANUS CAROLINENSIS Macquart

(Fig. 59, B)

*Tabanus carolinensis* Macquart, Diptères exotiques nouveaux ou peu connus, v. 1, pt. 1, p. 145, 1838; Hine, Ohio State Acad. Sci. Spec. Papers 5: 49, 1903. *Tabanus patulus* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 175, 1848.

Rather small but stout; dull brown, with three rows of faint abdominal spots, the lateral spots rather large; subcallus shiny.

*Female*.—Length 12-15 mm. Eye with very sparse, short pile, deep purple, with four green-blue bands. Frons about three times as high as wide, nearly parallel sided, the pollinose areas yellowish gray, denuded areas chestnut brown; basal callus usually slightly broader than high, touching eye margins, rounded above, with suture separating it from subcallus distinctly curved downward medianly; median callus usually separated from basal callus, a rectangle, higher than wide and consisting of a median raised line bordered by a dull-brown area, the whole narrower than frons; denuded area at vertex triangular, the apex sometimes joined to median spot; ocellar tubercle rather large but not sharply defined; subcallus completely denuded, shiny, rather convex, darker laterally. Antenna orange, the annulate portion black; first two segments with black hair, the dorsal process of second prominent; basal portion of third rather slender, dorsal angle distinct but rather short and dorsal surface of segment beyond base of process nearly straight; annulate portion equal in length to width of basal portion. Clypeus and genae light gray, with white hair. Second palpal segment short and stout, tapering apically, pale yellowish or brownish, with white hair and often scattered black hair apically.

Mesonotum dark brown, with mixed white and yellowish-brown hair. Pleura, sternum, and coxae gray, with white hair. Wing hyaline, veins brown, the costal cell and wing base infuscated; venation normal. Legs reddish brown, the fore tarsus and apex of fore tibia darker; hair of legs mostly pale, the hind tibial fringe distinct, largely black.

Abdomen above rather broad, dull brownish black, with a median row of indistinct triangles and sublateral row of indistinct, reddish, rather large spots; hind margins of segments fringed with whitish or yellowish hair, especially laterally; venter reddish gray.

*Male*.—Eye with very sparse, short pile, the facets of nearly uniform size over whole eye; a row of coarse black hair between eyes; frontal triangle gray; hair long on first antennal segment above; genae above with black hair. Claws of fore tarsus subequal. Rest of coloration similar to that of female but darker, the pile of pleura largely black and median abdominal spots very small or lacking.

*Cotypes*.—Both sexes, in the museum of Jardin des Plantes, Paris.

*Type locality*.—Carolina.

*Distribution*.—Oklahoma to Massachusetts and south to North Carolina. April 21 (Atoka County, Okla.) to July 27 (Cabin John, Md.). In the United States National Museum, 66 females, 8 males.

The type of *Tabanus patulus* Walker was studied by Hine, and the writer has seen a specimen compared by him with the type, which proves to be *carolinensis*. *T. carolinensis* is anomalous because of the nearly bare eye in both sexes combined with the ocellar tubercle and four-banded eye. The presence of coarse hair between the eyes of the male is found in this species and *T. oklahomensis* only, but the latter have heavily pilose eyes in both sexes.

#### TABANUS PROCYON Osten Sacken

(Fig. 60, A)

*Tabanus procyon* Osten Sacken, U. S. Geol. and Geogr. Survey Terr. Bull. 3: 216, 1877; Hine, Ohio Nat. 5: 241–242, 1904; Philip, Canad. Ent. 68: 153, 1936.

Rather small, stout; shiny black; subcallus denuded; palpus black.

*Female*.—Length 12–13 mm. Eye with dense pile, dark purple, with four green bands. Head generally shiny black, with some gray pollen on frons and upper posterior portion of genae. Frons scarcely more than twice as high as wide, the sides parallel; basal callus distinctly convex, transverse, about twice as broad as high, shiny black; a rounded, black, median callus; ocellar tubercle distinct, reddish; subcallus shiny black, somewhat swollen, with a distinct median depression. Antenna black; first segment not enlarged above; third segment slender, with scarcely any dorsal angle; annulate portion stout, shorter than basal portion; hair of genae long, brownish black. Palpus black, the second segment stout at base, with long black hair.



FIGURE 60.—Antenna, front view of head, and palpus of (A) *Tabanus procyon* and (B) *T. sequax*.

Body stout; whole of thorax, abdomen, and legs black, with dark-brown or black hair; a few white hairs on last two abdominal segments. Wing hyaline, with dark-brown costal cell, the cross veins and furcation margined with brown; venation normal.

*Male*.—Eye densely pilose, the facets not greatly differentiated in size; first two antennal segments with long black hair; frontal triangle shiny black, some-



what protuberant; palpus moderately stout. Body coloration essentially as in female.

*Type*.—Specimen collected between April 27 and May 9, one of two female cotypes in the Museum of Comparative Zoology, No. 14519, herein designated as lectotype.

*Type locality*.—Sonoma County, Calif.

*Distribution*.—British Columbia to California and Montana. April 12–14 (Cazadero, Calif.) to October (Yellowstone National Park, Wyo.). In the United States National Museum, seven females.

#### TABANUS SEQUAX Williston

(Fig. 60, B)

*Tabanus sequax* Williston, Kans. Acad. Sci. Trans. 10: 137, 1887; Hine, Ohio

Nat. 5: 243–244, 1904; Rowe and Knowlton, Canad. Ent. 67: 244, 1935.

*Theriopectes leucophorus* Bigot, Mem. Soc. Zool. France 5: 640, 1892.

*Tabanus fuscipalpus* Bigot, Mem. Soc. Zool. France 5: 681, 1892.

Medium sized; black; subcallus pollinose; furcation and cross veins margined with brown; basal callus higher than wide and not touching eyes.

*Female*.—Length 14–17 mm. Eye with dense, short pile. Frons yellowish gray, darker at level of median callus, two and one-half to three times as high as wide, with parallel sides; hair of frons black, long at vertex; basal callus a shiny black triangle, distinctly separated from eyes by a line of pollen and tapering to a slender median callus which reaches to vertex; vertex with a rather large, somewhat shiny, black spot only slightly swollen and with no ocellar tubercle; subcallus yellowish gray, a crescentic depression above each antennal pit yellow. Antenna entirely black; first two segments with black hair; third rather slender, the dorsal angle not prominent and the dorsal excision very shallow; annulate portion about equal in length to width of basal portion and about two-thirds length. Clypeus and genae gray, with mostly yellowish-white hair, the genae tinged with yellow above near eyes. Palpus dark reddish brown or grayish black, of moderate thickness, with black hair.

Thorax black, with faint lines of gray pollen and yellowish hair on dorsum in usual pattern; long creamy hair around wing base and on anterior part of pleura and sternum, the rest mostly black. Wing hyaline, with dark-brown veins and distinct infuscation at cross veins and furcation; venation normal. Legs black, the tibiae slightly brownish, with a few white hairs basally.

Abdomen black, each tergite with a narrow hind border of whitish pollen and hair interrupted on each side of the small median triangular expansion and somewhat widened laterally; venter with narrow whitish incisures.

*Male*.—Unknown.

*Cotypes*.—Three females, collection unknown.

*Type locality*.—Mount Hood, Oreg.

*Distribution*.—From British Columbia to Oregon and Montana. July 10 (Moore's Lake, Idaho) to August 20 (Glacier, British Columbia). In the United States National Museum, 27 females.

The type of *Tabanus fuscipalpis* was studied by Hine and, according to his notes, found to be the same as *T. sequax*.

#### TABANUS LASIOPHTHALMUS Macquart

(Fig. 61, A)

*Tabanus lasiophthalmus* Macquart, Diptères exotiques nouveaux ou peu connus, v. 1, pt. 1, pp. 143–144, 1838; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 465–466, 1876; Hine, Ohio State Acad. Sci. Spec. Papers 5: 51, 1903; U. S. Dept. Agr., Bur. Ent. Tech. Ser. 12: 19–22, 1906; McDunnough, Canad. Ent. 53: 142, 1921; Cameron, Bull. Ent. Research 17: 31–32, 1926; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 13–25, 108, 1931; Schwardt, Ark. Agr. Expt. Sta. Bull. 332: 38–41, 1936.

*Tabanus punctipennis* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 2, p. 39, 1847. (Preoccupied by *Tabanus punctipennis* Macquart 1839.)  
*Tabanus notabilis* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, pp. 166-167, 1848.  
*Tylostypia lasiophthalmus* Enderlein, Mitt. Zool. Mus. Berlin 11: 363, 1925.

Rather small; abdomen with orange laterally; infuscation at furcation and cross veins; subcallus denuded.

*Female*.—Length 12-15 mm. Eye densely pilose, deep purple, with four narrow, pale-blue-green bands. Frons yellowish gray, with black hair, about three and one-half times as high as width across basal callus, distinctly widened above; a well-defined, reddish, ocellar tubercle; basal callus shiny orange brown to black, nearly square, slightly narrowed above; median callus short, black, separated from basal callus; subcallus denuded except around margins, shiny and concolorous with basal callus. First two antennal segments yellowish brown, with black hair; third orange, the annulate portion black; basal portion with a distinct, obtuse, dorsal angle and moderate dorsal excision, the annulate portion slightly shorter than basal portion. Clypeus and genae white, the latter tinged with yellow above, with creamy hair. Second palpal segment creamy, with black hair, somewhat swollen basally and tapering to a rather sharp apex.

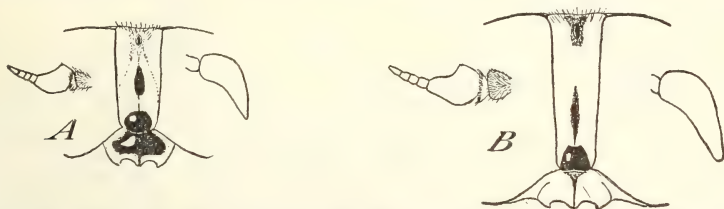


FIGURE 61.—Antenna, front view of head, and palpus of (A) *Tabanus lasiophthalmus* and (B) *T. californicus*.

Mesonotum black, with lines of yellowish-gray pollen and hair in usual pattern; prescutal lobe reddish. Pleura, sternum, and coxae reddish and gray, with a mixture of gray and black hair. Wing nearly hyaline, the costal cell tinged with brown and furcation and all cross veins distinctly margined with brown; venation normal. Femora gray basally, orange brown apically; tibiae orange brown, the anterior tibia slightly darker apically; hind tibial fringe yellowish on basal half, black apically; tarsi darker, orange brown.

Abdomen above orange brown, with a black median stripe as wide as scutellum on first tergite, narrow on tergites 2-4 and widening beyond fourth; on tergites 2-5 distinct, yellowish-brown, sublateral, oblique spots, paler than the orange-brown ground color; venter nearly uniformly yellowish brown.

*Male*.—Eye facets nearly uniform in size. Frontal triangle gray. Coloration otherwise as in female, the venter with some black medianly and apically.

*Type*.—Female, collection unknown.

*Type locality*.—Carolina.

*Distribution*.—Alberta to Quebec and south to Colorado, Louisiana, and South Carolina. March 18 (New Orleans, La.) to August 25 (Baddeck, Cape Breton Island, Nova Scotia). In the United States National Museum, 117 females, 45 males.

#### TABANUS CALIFORNICUS Marten

(Fig. 61, B)

*Tabanus californicus* Marten, Canad. Ent. 14: 210, 1882; Hine, Ohio Nat. 5: 236, 1904; McDunnough, Canad. Ent. 53: 141, 1921.

*Tabanus affinis* Howard (not Kirby), The Insect Book, pl. 16, fig. 14, 1901.

Medium-sized; brownish, with sides of abdomen above and hind tibial fringe orange; prescutal lobe yellowish; frons narrow; third antennal segment with prominent dorsal angle.

*Female*.—Length 17–19 mm. Eye densely pilose, deep purple, with four blue-green, diagonal bands. Frons yellowish, with black hair, about four and one-half times as high as width at base and distinctly widened above; ocellar tubercle small, reddish, surrounded by a reddish-brown denuded area; basal callus dark reddish, small, rounded above and not quite touching eyes; median callus black, slender, and narrowly joined to basal callus; subcallus pale yellowish. First two antennal segments yellow, with black hair; third with basal portion orange, annulate portion dark brown or black; basal portion nearly as broad as long, the dorsal angle prominent but the dorsal excision shallow; annulate portion slender, equal in length to basal portion. Clypeus and genae pale yellowish, with concolorous hair. Second palpal segment pale yellow, slightly swollen basally, with short black hair.

Mesonotum black, with pale-yellow hair and faint indication of stripes; humeral and prescutal lobes yellow brown. Pleura, sternum, and coxae mostly dark, with pale-yellow hair. Wing hyaline, the costal cell pale yellow; venation normal. Femora black, except apices of middle and hind pair, which are yellow brown; tibiae yellow brown, the apex of the fore tibia darkened; tarsi dark brown, the fore tarsus darkest; hind tibial fringe yellow brown.

Abdomen broadly yellow brown on tergites 1–4, the median black stripe narrow, widening on tergite 4, the following tergites entirely black; sternites 1–4 yellow brown, the rest black, all with yellow hair.

*Male*.—Unknown.

*Type*.—Female, lost.

*Type locality*.—California.

*Distribution*.—British Columbia to California. July 8 (Kaslo, British Columbia) to August 8 (Squaw Lake, Mount Rainier, Wash.). In the United States National Museum, 4 females.

This species was made a synonym of *epistates* Osten Sacken by Hine, but McDunnough recognized the species, pointing out its larger size. It is close to *affinis* Kirby, but the third antennal segment is not so strongly excised, the palpus is slightly thicker, and the abdominal coloration is more yellow brown than orange red. The hind tibial fringe is also orange rather than black. The specimen figured in Howard's Insect Book under the name of *Tabanus affinis* is this species.

#### TABANUS AURILIMBUS, new species

(Fig. 62, A)

Medium sized; abdomen broadly orange laterally; hind tibial fringe orange; eye pilose; ocellar tubercle present; palpus rather slender.

*Female*.—Length 16–17 mm. Eye with short pile, purple, with four green bands. Whole head dull yellowish, the sides of clypeus somewhat grayish; clypeus and genae with yellowish hair. Frons about three and one-half times as high as width at base, slightly widened above; basal callus brownish to black, about as high as wide, not quite touching eye margins and rounded above; median callus black, slightly longer than basal callus, the connection with basal callus usually thinly pollinose; ocellar tubercle prominent, orange to reddish brown. First two antennal segments yellow brown, with concolorous hair, the second with a strong dorsal process; third orange, the annulate portion and dorsal margin from dorsal angle to base of annulate portion black; basal portion moderately stout, the dorsal angle prominent but obtuse, the excision moderate. Second palpal segment rather slender, yellowish brown, with concolorous hair.

Mesonotum blackish, with five narrow but distinct yellowish-gray stripes in the usual pattern; prescutal lobe orange, with black hair; upper portion of pleura brownish, the lower part, sternum, and coxae gray, all with yellowish-white hair. Wing subhyaline, the costal cell brownish and all veins faintly margined with brown; venation usually normal, one paratype with a short stump from vein  $R_4$  in both wings. Femora black, the apices somewhat brownish, particularly on the middle and hind femora; tibiae orange brown, the fore tibia darkened apically; hind tibial fringe strong, concolorous with tibia; tarsi dark brown to black, the fore tarsus darkest.



Abdomen above orange brown; tergite 1 medianly, a narrow median stripe on anterior half of tergite 2, tergite 4 medianly, and most of tergites 5-7 blackish; rather distinct, yellowish-brown, median triangles and sublateral spots on tergites 2-5 or 6, the median triangles rather broader than in other of the orange-sided species; sublateral spots with inner margins parallel, outer margins oblique and reaching to lateral margins; venter yellow orange, with concolorous hair, sometimes blackened apically and in a narrow median stripe.

*Male*.—Unknown.

*Type*.—Female, Boston Society of Natural History. Four paratypes, collections of Graham Fairchild and of the United States National Museum (No. 51970).

*Type locality*.—Paris, Maine.

The type was collected by C. F. Frost, July 14, 1936. The paratypes were collected at Northboro, Mass., July 5, 1936, by C. F. Frost; at Reading, Mass., June 29, 1933; and at Rock, Mass.

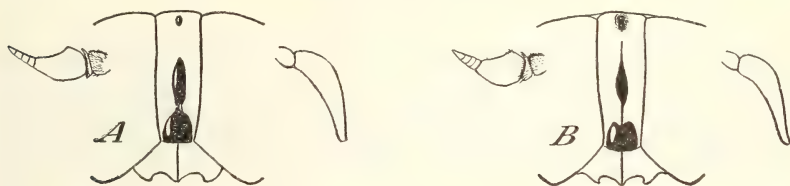


FIGURE 62.—Antenna, front view of head, and palpus of (A) *Tabanus aurilimbus* and (B) *T. trepidus*.

This species is close to *trepidus* McDunnough, but in *trepidus* the palpus is clothed with black hair and is even more slender and tapering, the antenna has a shallower dorsal excision, there is more black on the abdomen, and the hind tibial fringe is black.

#### TABANUS TREPIDUS McDunnough

(Fig. 62, B)

*Tabanus trepidus* McDunnough, Canad. Ent. 53: 142, 1921; Stone, Ann. Ent. Soc. Amer. 23: 301-302, 1930; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 117, 1931.

Rather small, stout; abdomen with orange sides; subcallus pollinose; palpus unusually slender; basal portion of third antennal segment with strong dorsal angle but almost no excision.

*Female*.—Length 13-15 mm. Eye pilose, deep purple, with four green bands. Frons gray tinged with yellowish brown, about three and one-half times as high as basal width, widened above; basal callus shiny dark brown to black, subquadrate, usually with a dorsal notch and not quite touching eyes; median callus black, slender, usually narrowly joined to basal callus; ocellar tubercle orange brown; subcallus, clypeus, and genae yellowish gray, the hair yellowish. Antenna orange, the first two segments and annuli sometimes blackish; dorsal angle of third segment prominent, the width of basal portion being only slightly less than the length; dorsal excision very shallow; annulate portion shorter than basal portion. Second palpal segment unusually slender, orange brown.

Thorax dark brown to black, with faint lines of lighter pollen above; prescutal lobe usually orange; hair of pleura mixed yellow and black. Wing hyaline, the costal cell and anterior portion of wing tinged with brown. Legs black, the fore tibia tinged with brown, the middle and hind tibiae orange brown; hind tibial fringe black.

Abdomen orange brown, with a black median stripe widening apically; faint yellowish sublateral spots and a yellowish median spot at posterior margins of segments 1-4; venter yellowish brown.

*Male*.—Eye densely pilose, the areas of large and small facets rather distinctly differentiated; and, in the two dried specimens seen, the lower of the larger facets yellowish. Body coloration essentially as in female.

Described from specimen reared from a larva collected May 21, 1927, in sphagnum near Ithaca, N. Y., which emerged a month later.

*Type*.—Female, Canadian National Collection. Paratypes, Canadian National Collection; three paratype females, Museum of Comparative Zoology No. 14115.

*Type locality*.—Ottawa, Canada.

*Distribution*.—British Columbia to Ontario and Maine and south to Montana, Wisconsin, and New Jersey. June 8 (Bar Harbor, Maine) to August 26 (Cook, Minn.). In The United States National Museum, 29 females, 1 male.

#### TABANUS GRACILIPALPIS Hine

(Fig. 63, A)

*Tabanus gracilipalpis* Hine, Canad. Ent. 55: 143–144, 1923; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 107, 1931.

*Tabanus cristatus* Curran, Canad. Ent. 59: 81–82, 1927. (New synonymy.)

Medium sized; dark brown, with the orange on sides of abdomen not reaching to anterior margin of first tergite; subcallus pollinose; palpus very slender; third antennal segment with a distinct dorsal excision.



FIGURE 63.—Antenna, front view of head, and palpus of (A) *Tabanus gracilipalpis* and (B) *T. philipi*.

*Female*.—Length 14–15 mm. Eye with dense, short pile. Frons three to three and one-half times as high as basal width, slightly widened above, yellowish gray, with black hair; basal callus shiny black, somewhat rugose, and not touching eyes; median callus black, nearly twice as long as basal callus and rather narrowly joined to it; ocellar tubercle orange brown, the vertex somewhat depressed behind it; subcallus, clypeus, and genae yellowish gray, with yellowish hair below level of antennae. First two antennal segments gray, with black hair; third orange, the annulate portion darker; basal portion rather slender but with a strong, blunt, dorsal angle and distinct dorsal excision. Second palpal segment slender, dark yellowish brown, with black hair.

Mesonotum black, with very indistinct yellowish stripes and the prescutal lobe sometimes tinged with orange. Pleura, sternum, and coxae dark gray, with black and pale-yellowish hair. Wing subhyaline, the costal cell yellowish; venation normal. Femora black; tibiae orange brown, the apical two-thirds of fore tibia and apices of others blackened; tarsi black, with orange hair below.

Abdomen above black, with orange on sides from apical third of tergite 1 to tergite 4, with oblique yellowish spots superimposed on tergites 2 and 3; median black band broad, nearly parallel sided, with broad, yellowish, median spots; venter yellowish brown, with considerable black at base and apex.

*Male*.—Facets of eye nearly uniform in size. Coloration of body essentially as in female. The middle of tergites 2–4 with heavy, erect, black hair.

*Type*.—A female, United States National Museum No. 26822. Paratypes, two females, United States National Museum No. 26822; one paratype in the collection of Ohio State University.

*Type locality*.—Camp 334, near Fairbanks, Alaska.

*Distribution*.—Alaska to Newfoundland. June 10 (Fawcett, Alberta) to July 20 (Stephensville, Bay St. George, Newfoundland). In the United States National Museum, six females.

Philip pointed out to the writer the similarity between the females of *Tabanus cristatus* Curran and *T. gracilipalpis*. Specimens which the writer compared with the allotype female of *cristatus* do agree with the type series of *gracilipalpis*. The female of *gracilipalpis* is very close to that of *T. affinis* Kirby, and specimens collected at the same time and place as the type series of *gracilipalpis* seem to be *affinis*. The males of *cristatus* and *affinis* are quite distinct, however, and, unless the sexes are not correctly associated in *cristatus*, the species is distinct from *affinis*.

#### TABANUS PHILIPI, new species

(Fig. 63, B)

Rather small; abdomen laterally broadly orange; frons rather broad, with parallel sides; antenna black; palpus stout.

*Female*.—Length 12 mm. Eye densely pilose. Frons gray, slightly less than twice as high as wide, with nearly parallel sides; basal callus dark chestnut brown, transverse, nearly twice as wide as high, rounded above; median callus small, indistinct, narrowly connected with basal callus; ocellar tubercle prominent, yellow brown; subcallus flat, gray. Antenna black, the first two segments with black hair; basal portion of third scarcely longer than annulate portion, with low dorsal angle and no excision. Clypeus and genae light gray, with mostly yellowish-white hair. Palpus creamy white, the first segment with mostly white hair, second with mostly black; second swollen basally but tapering to acute apex. Proboscis extending little beyond palpus.

Thorax blackish, the prescutal lobes tinged with reddish, and hair mixed black and yellowish white. Wing hyaline, the costal cell and a small spot at furcation brownish; venation normal. Coxae gray, with white hair; femora black or dark brown; tibiae yellowish brown, the fore tibia darkened apically; hind tibial fringe black; tarsi dark brownish, the fore tarsus darkest.

Abdomen black above, tergites 1-3 orange laterally and this color faintly extending onto tergite 4; median dark area rather broad; pale median spots indistinct; tergites with narrow, pale, posterior margins; venter black, with sides broadly orange and incisures rather broadly yellowish.

*Male*.—Unknown.

*Type*.—Female, in the American Museum of Natural History.

*Type locality*.—Seattle, Wash.

The type was collected July 15, 1901. It bears a determination of "*Tabanus pumilus* Macquart" in Hine's handwriting and another by W. Marchand as "*T. typhus* ?." It is very distinct from either of these species. The writer takes great pleasure in naming this species in honor of Cornelius B. Philip, who has so generously shared his knowledge of the Tabanidae.

#### TABANUS SONOMENSIS Osten Sacken

(Fig. 64, A)

*Tabanus sonomensis* Osten Sacken, U. S. Geol. and Geogr. Survey Terr. Bull. 3: 216-217, 1877; Coquillett, Wash. Acad. Sci. Proc. 2: 407, 1900; Hine, Ohio Nat. 5: 244, 1904; McDunnough, Canad. Ent. 53: 143, 1921; Rowe and Knowlton, Canad. Ent. 67: 244, 1935.

Rather small; orange on side of abdomen basally; antenna black; eye pilose; subcallus pollinose; second palpal segment enlarged basally; third antennal segment with low dorsal angle and little, if any, excision; vein  $R_4$  frequently with a stump vein.



*Female*.—Length 12–15 mm. Eye with short pile, blue green, with three narrow brownish-purple bands. Frons gray tinged with yellow, with black hair, about four times as high as width at base, distinctly widened above; frontal callus dark brown to black, subquadrate, touching eyes; median callus black, spindle shaped, usually joined by a slender line to both basal callus and ocellar tubercle; ocellar tubercle prominent, reddish brown; subcallus concolorous with frons. Antenna black, the extreme base of third segment sometimes tinged with reddish; first two segments with black hair, the second with a distinct dorsal process; third with a low, obtuse, dorsal angle and very slight excision; annulate portion slightly shorter than basal portion. Clypeus and genae gray, with yellowish-white hair below and some black hair at upper angle of genae. Palpus yellowish brown, with concolorous and some black hair, the second segment distinctly swollen basally.

Mesonotum black, with erect black hair, some recumbent yellowish hair, and narrow grayish stripes in usual pattern; prescutal lobe reddish brown. Pleura, sternum, and coxae dark gray, with a mixture of black and yellowish-white hair. Wing hyaline, the costal cell, margin of some of the veins, and furcation faintly brown; cell  $R_5$  slightly narrowed apically and usually a stump at base of vein  $R_4$ . Femora black; tibiae dull orange brown except for black apical third of fore tibia; hind tibial fringe black; tarsi black to dark orange brown, the fore tarsus darkest.

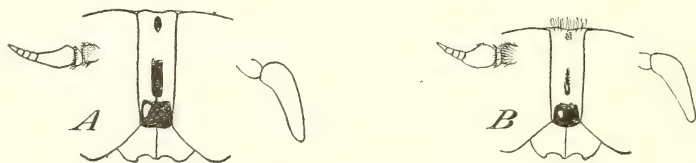


FIGURE 64.—Antenna, front view of head, and palpus of (A) *Tabanus sonomensis* and (B) *T. daeckei*.

Abdomen above black, with orange laterally on tergites 1–4, most extensive on tergites 2–3; median black stripe with faint grayish triangles and each tergite with a narrow gray band on hind margin; venter orange brown, with black medianly, sometimes on lateral margins, and apically; hair of venter predominantly pale yellowish, often with some erect black hair medianly and apically.

*Male*.—Eye with dense, long pile, the areas of large and small facets not greatly differentiated. Second palpal segment stout, with black hair. Hair of genae black. Claws of fore tarsi subequal. Thorax somewhat darker than in female, the rest of coloration essentially the same.

*Type*.—Lectotype labelled and herein designated, one of four cotypes in the Museum of Comparative Zoology, No. 14520, from Sonoma County, Calif., April 27–May 9. Five other cotypes in the same cotype series bear other data.

*Type locality*.—Sonoma County, Calif.

*Distribution*.—Southern Alaska and Alberta to central California and Colorado. April 27 (Sonoma County, Calif.) to October 6 (Layton, Utah). In the United States National Museum, 145 females, 3 males.

#### TABANUS SONOMENSIS variety PHAENOPS Osten Sacken

*Tabanus phaenops* Osten Sacken, U. S. Geol. and Geogr. Survey Terr. Bull. 3: 217, 1877; Hine, Ohio Nat. 5: 241, 1904; McDunnough, Canad. Ent. 53: 143, 1921; Webb and Wells, U. S. Dept. Agr. Dept. Bull. 1218: 20–26, 1924; Cameron, Bull. Ent. Research 17: 33–34, 1926; Rowe and Knowlton (not Osten Sacken), Canad. Ent. 67: 243, 1935.

*Therioplectes phaenops* Townsend, Calif. Acad. Sci. Proc. (2) 4: 597, 1895.

? *Therioplectes maculifer* Bigot, Mem. Soc. Zool. France 5: 641, 1892.

*Female*.—Somewhat darker than the typical *sonomensis*, the prescutal lobe and palpus often, but not always, black. Frons slightly narrower. Hair of lower genae often black. Thorax darker, subshiny, with no pale hair. Furca-

tion not margined with brown. Abdomen usually with as much orange, but the short hair on the entire venter black, with very little yellowish hair.

*Male*.—Coloration essentially as in female.

*Type*.—One of four female cotypes, Museum of Comparative Zoology No. 14520, labelled and herein designated as lectotype.

*Type locality*.—Webber Lake, Calif.

*Distribution*.—Oregon and Idaho to central California and Utah. June 22 (Bridgeport, Calif.) to September 19 (Kosmo, Utah). In the United States National Museum, 106 females, 32 males.

The characters utilized by Rowe and Knowlton will not serve to separate the types of *Tabanus sonomensis* and *T. phaenops*, and nearly all of the specimens from Utah which they studied are true *sonomensis*. It may be that these two forms are specifically distinct but they agree so closely in structure that the writer prefers to consider them as varieties of the species.

Hine examined the type of *Tabanus maculifer* Bigot and determined it as *phaenops* Osten Sacken. This species is extremely abundant in the West and is one of the more serious pests of livestock. Webb and Wells reared and collected a number of specimens of variety *phaenops* at Topaz, Calif.

#### TABANUS DAECKEI Hine

(Fig. 64, B)

*Tabanus daeckei* Hine, Ohio Jour. Sci. 17: 269-270, 1917.

Rather small; abdomen with orange sides and a faint, continuous, yellowish-brown, median stripe on the black median portion; subcallus pollinose; antenna mostly black. (Atlantic coast.)

*Female*.—Length 12-13 mm. Eye greenish blue, with three diagonal bronzy bands and short brownish pile. Frons about three and one-half times as high as width at base, widened above, with orange pollen and black hair; basal callus black, convex, square or slightly wider than high; median callus spindle-shaped, not well defined, nearly or quite separated from basal callus; ocellar tubercle dark brownish to black, not well defined; subcallus, clypeus, and genae yellowish gray. First two antennal segments yellowish brown, with black hair, the dorsal process of second prominent; third orange brown at base, black beyond dorsal angle; basal portion rather short and stout, scarcely excised above; annulate portion as long as basal portion, rather stout. Second palpal segment pale yellowish, somewhat swollen at base, and tapering to a point, with black and yellowish hair.

Thorax nearly black, with yellowish and black hair; prescutal lobe orange brown. Wing pale brownish, without any spotting; venation normal. Coxae and bases of femora dark, with grayish pollen; apices of femora and the tibiae orange brown, the apex of fore tibia dark; tarsi darker brown; hind tibial fringe long and black.

Abdomen above orange brown, with a black median stripe starting on first tergite the width of scutellum, narrowing on second, widening on third and fourth, the fifth to seventh entirely black; on black stripe a row of faint, elongate, yellowish triangles forming a median stripe; all tergites with a thin posterior fringe of yellow hair; venter orange brown, except middle of first sternite and apex, which are black.

*Male*.—Eye densely covered with long brown pile. Areas of large and small facets weakly differentiated near middle. Second palpal segment creamy colored, with black hair, moderately swollen. Coloration essentially as in female, but with a large black spot in middle of second sternite.

*Type*.—Female, in the collection of Ohio State University.

*Type locality*.—Cape May, N. J.

*Distribution*.—Coast from New Jersey to Virginia. May 24 (Nassau, Del.) to July 6 (Dover, Del.). In United States National Museum, 88 females, 11 males.

## TABANUS EPISTATES Osten Sacken

(Fig. 65, A)

*Tabanus socius* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 467, 1876. (Preoccupied by *Tabanus socius* Walker.)

*Tabanus epistates* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (sup.): 555, 1878; Malloch, Ill. State Lab. Nat. Hist. Bull. 12: 360, 1917; McDunnough, Canad. Ent. 53: 142-143, 1921; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 33, 105, 1931.

*Tabanus epistatus* Hine, Ohio State Acad. Sci. Spec. Papers 5: 50, 1903; Hine, Ohio Nat. 5: 236, 1904.

Rather small; orange brown on sides of abdomen extending across first tergite; subcallus pollinose; antenna mostly orange, with a pronounced dorsal angle; second palpal segment swollen at base.

*Female*.—Length 13-16 mm. Eye with short pile, green blue, with three dark-purple bands. Frons about five times as high as width at base, but distinctly widened above, gray or yellowish brown, with black hair; ocellar tubercle shiny dark red, prominent; basal callus dull black, nearly square, usually not quite touching eye margins; median callus linear, joined to basal callus and reaching half way to vertex; subcallus, clypeus, and genae gray, often tinged with yellow.

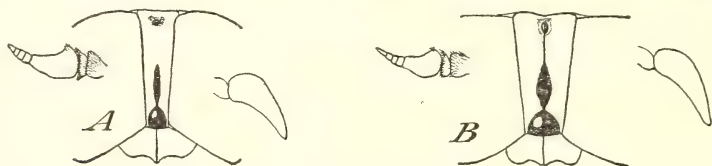


FIGURE 65.—Antenna, front view of head, and palpus of (A) *Tabanus epistates* and (B) *T. haemaphorus*.

low; hair of clypeus and genae cream colored. Antenna orange, the apex of third segment sometimes darkened; first two segments with black hair; basal portion of third rather broad, with a distinct dorsal angle and moderate dorsal excision; annulate portion distinctly shorter than basal portion. Second palpal segment swollen basally, tapering to a sharp apex, white or cream colored, with black and white hair. Proboscis rather short.

Mesonotum dark gray, with black and white hair, the usual lines rather indistinct; prescutal lobe reddish. Pleura, sternum, and coxae dark gray. Wing hyaline, the costal cell and vein margins of fore part of wing often distinctly tinged with brown; venation normal. Femora black, with gray pollen; fore tibia at base, entire middle tibia, and hind tibia except apex orange; tarsi dark reddish to black; legs with gray and cream-colored hair, the hind tibial fringe black, with scattered cream-colored hairs near base.

Abdomen above black, with sides of tergites 1-4 largely orange, extending across first tergite; median white spots small; venter orange brown, darker apically, and with a dark median spot on sternite 1, usually extending onto sternite 2.

*Male*.—Eye with dense brown pile, the facets nearly uniform in size; clypeus, genae, and palpus somewhat browner than in female; second palpal segment distinctly swollen. Black stripe on abdomen somewhat more constricted on third segment than in female.

*Type*.—One (No. 4026-2) of 10 cotype females in the Museum of Comparative Zoology, No. 4026, herein designated as lectotype.

*Type locality*.—Fort Simpson, Hudson Bay Territory.

*Distribution*.—Alaska to Quebec and south to Utah, Ohio, and New York. May 30 (Meadville, N. Y.) to August 17 (Slave Lake, Alberta). In United States National Museum, 28 females, 8 males.



## TABANUS HAEMAPHORUS Marten

(Fig. 65, B)

*Tabanus haemaphorus* Marten, Canad. Ent. 14: 210-211, 1882; McDunnough, Canad. Ent. 53: 141, 1921.

Medium sized; orange brown, the orange on side of abdomen extensive, reaching to anterior margin of first tergite; subcallus pollinose; third antennal segment not strongly excised and with some orange basally; frons broad and distinctly widened above.

*Female*.—Length 16-17 mm. Eye densely pilose, deep purple, with four bluish-green bands. Frons gray tinged with yellow, three to three and one-half times as high as width at base, somewhat widened above; basal callus dark brown, square or slightly wider than high, rounded above; median callus black, joined by a narrow line to basal callus and to the orange ocellar tubercle; subcallus, clypeus, and genae gray, the upper genae with black hair, lower genae and clypeus with cream-colored hair. First two antennal segments yellowish brown, with black hair; third orange proximad of dorsal angle, black distally; basal portion moderately stout, with a moderate dorsal excision; annulate portion slightly longer than width and shorter than length of basal portion. Second palpal segment stout, creamy white, with black hair.

Mesonotum brownish black, with gray lines in usual pattern; prescutal lobe orange; rest of thorax and coxae dark grayish, with a mixture of dark and cream-colored hairs. Wing hyaline, the costal cell, furcation, cross veins, and anterior longitudinal veins faintly margined with brown; femora dark gray, tinged with orange apically; tibiae orange, the apex of fore tibia darkened; fore tarsus darkened, the others nearly concolorous with tibiae; hind tibial fringe prominent, black.

Abdomen above orange, with a median black stripe widening posteriorly on which lies a median row of small yellowish spots, that on tergite 2 sometimes reaching anterior margin; orange on sides of first tergite reaching to anterior margin; venter dull orange, darkened apically and medianly.

*Male*.—Eye with dense brown pile, the facets nearly uniform in size; third antennal segment black except at extreme base; palpus yellowish brown, with a mixture of long black and white hairs, the second segment stout, about twice as long as greatest width, with an acute apex. Fore tibia nearly uniformly dark brown; fore tarsal claws subequal in length. Sternites 2-4 entirely orange, the first with a median black spot and 5-7 largely black.

Described from a specimen collected at Poudre River Canyon, Colo., June 28, 1931, by L. D. Anderson, in the collection of C. B. Philip.

*Cotypes*.—Two females, lost.

*Type locality*.—California.

*Distribution*.—British Columbia to California and Colorado. May 30 (Mount Lehman, British Columbia) to August 15 (Kaslo, British Columbia). In the United States National Museum, 20 females.

## TABANUS AFFINIS Kirby

(Fig. 66, A)

*Tabanus affinis* Kirby, Fauna Boreali-Americana, v. 4, pp. 313-314, 1837; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 466, 1876; Bethune, Canad. Ent. 13: 166-167, 1881 (compiled from Kirby); Hine, Ohio Nat. 5: 234, 1904; McDunnough, Canad. Ent. 53: 141, 1921; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 102, 1931.

*Tabanus triligatus* Walker, List of the Dipterous Insects in the Collection of the British Museum, pt. 5, sup. 1, pp. 183-184, 1854.

Largest species, in our fauna, of the group with eye pilose and ocellar tubercle present; abdomen with orange laterally; wing hyaline.

*Female*.—Length 16-19 mm. Eye with dense, short pile, deep purple, with four blue-green diagonal bands. Frons about three and one-half times as high as width at base, somewhat widened above, yellowish brown, with short black hair; basal callus black or dark reddish, subquadrate, not quite touch-

ing eyes; median callus black, spindle shaped, about one-third width of frons and usually connected with basal callus; ocellar tubercle well defined, dark reddish, situated at apex of a black triangle, the base of which rests on hind margin of vertex; subcallus, clypeus, and genae yellowish gray, the clypeus and genae with concolorous hair. First two antennal segments dark orange or black, with black hair; third dark orange at base, the annulate portion black, the transition gradual; basal portion with a strong dorsal angle and excision; annulate portion about equal to greatest width of basal portion. Second papal segment rather slender, dark orange, with short black hair.

Mesonotum black, with faint yellowish lines; prescutal lobe usually more or less orange. Pleura, sternum, and coxae dark gray, with mostly yellowish-gray pile. Wing nearly hyaline, the costal cell and region of central cross veins brownish and a faint spot at furcation. Legs black, the middle and hind tibiae and tarsi, and base of fore tibia, largely dark orange; hind tibial fringe prominent, black.

Abdomen above black, the sides of tergites 1-3 or 1-4 more or less deep orange, leaving a broad, black, median stripe on these segments; this orange may extend across fourth tergite onto fifth, or the fourth may be almost entirely black; often oblique yellow spots on orange of tergites 2-3; hind margins of tergites with narrow pale borders which widen slightly medianly to form wide,

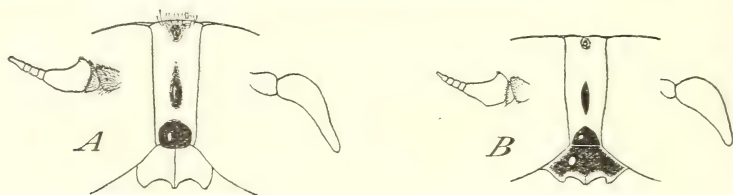


FIGURE 66.—Antenna, front view of head, and palpus of (A) *Tabanus affinis* and (B) *T. nudus*.

but short, pale-yellowish triangles; venter deep orange, darker apically and on center of sternites 1-2, with pale-yellowish posterior fringes on sternites.

*Male*.—Eye densely pilose, with facets of uniformly small size; second palpal segment about twice as long as its greatest width, blunt at apex. Dorsal black stripe of abdomen considerably narrower than in female, interrupted by median yellow spots on segments 2-3; black of venter confined to last three sternites.

*Type*.—Sex and collection unknown.

*Type locality*.—Latitude 65°, Canada.

*Distribution*.—Northern North America from Alaska to Newfoundland south to Arizona and Connecticut. June 13 (Anchorage, Alaska) to August 17 (Rigolette, Newfoundland). In the United States National Museum, 64 females, 15 males.

Osten Sacken and Hine both examined the type of *Tabanus triligatus* Walker and established the synonymy. Specimens sent to the British Museum by Philip were also compared with the type by Austen and declared to be the same. Walker's description is very misleading, particularly as to size. A number of males were found by the writer hovering on top of Bear Mountain in Connecticut (2,354 feet altitude) around 10 a. m., July 26, 1934.

#### TABANUS NUDUS McDunnough

(Fig. 66, B)

*Tabanus nudus* McDunnough, Canad. Ent. 53: 143, 1921; Hine, Canad. Ent. 55: 144, 1923; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 112-113, 1931.

Medium sized; blackish brown, the orange on side of abdomen reaching across first tergite; wing not distinctly spotted; subcallus denuded; second

palpal segment strongly swollen at base, pale cream colored; basal callus flat and somewhat wrinkled.

*Female*.—Length 14–17 mm. Eye densely pilose, green, with three diagonal purple bands. Frons yellow brown, paler just above basal callus, a little less than four times as high as width at base and distinctly widened above; basal callus orange brown, square or transverse, nearly touching eyes, and usually flat and wrinkled; median callus elongate, black, often narrowly connected with basal callus and the distinct, orange-brown, ocellar tubercle; subcallus denuded, flat, shiny orange brown, often nearly black on sides. First two antennal segments yellowish, with black hair; third orange, somewhat darkened above beyond dorsal angle, the annulate portion nearly black; basal portion stout, nearly as broad as long, the dorsal angle prominent, dorsal excision moderate; annulate portion shorter than width of basal portion. Clypeus and genae pale gray, often tinged with orange above palpi and with dense cream-colored hair. Second palpal segment short, very stout at base, tapering to an acute apex, cream colored, with concolorous and often scattered black hair.

Mesonotum dark brownish black, with rather distinct stripes of yellowish-brown hair; prescutal lobe orange, with black hair. Pleura, sternum, and coxae gray, with white hair, the mesopleurite tinged with orange and with some black hair. Wing hyaline, the costal cell, margins of veins in basal portion of wing, and furcation faintly tinged with grayish brown; venation normal. Femora gray, the apices of at least the middle femur orange; tibia orange brown, the fore tibia distinctly darkened apically; hind tibial fringe black or black mixed with yellow; tarsi orange brown to black, the fore pair darkest.

Abdomen above orange brown, with a black median stripe, widening apically; a median row of small yellowish triangles and rather distinct, oblique, yellowish, sublateral spots on tergites 2–4 or 2–5; venter orange brown, darkened apically, with dull-yellowish posterior bands.

*Male*.—Eye facets almost uniformly small; frontal triangle with gray pollen. Outer claw of fore tarsus considerably longer than inner claw. Body coloration as in female, the orange on abdomen usually more extensive.

*Type*.—Female, Canadian National Collection, Ottawa. Paratypes, Canadian National Collection; three paratypes, Museum of Comparative Zoology.

*Type locality*.—Ottawa, Canada.

*Distribution*.—Alaska and Maine to Wyoming and Massachusetts. May 26 (Lanoraie, Quebec) to July 15 (Banff, Alberta). In the United States National Museum, 37 females, 4 males.

#### TABANUS CAPTONIS Marten

(Fig. 67, A)

*Tabanus reccdens* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 5, sup. 1, p. 201, 1854. (Preoccupied by *Tabanus reccdens* Walker, 1848.)

*Tabanus captonis* Marten, Canad. Ent. 14: 211, 1882; Hine, Ohio Nat. 5: 235, 1904; McDunnough, Canad. Ent. 53: 141–142, 1921.

*Tabanus comastes* Williston, Kans. Acad. Sci. Trans. 10: 137–138, 1887.

Medium sized; orange brown, with orange on side of abdomen reaching to anterior margin of first tergite, third antennal segment stout, with a distinct dorsal angle; subcallus denuded; palpus brownish, not greatly swollen.

*Female*.—Length 14–17 mm. Eye with dense, short pile, deep purple, with four diagonal green-blue bands. Frons yellowish brown, about three and one-half times as high as width at base, decidedly widened above; basal callus orange brown to black, subquadrate, not touching eyes and distinctly convex in profile; median callus rather short and stout, black, separated from, or narrowly joined to, basal callus and usually with a median longitudinal depression; vertex with a rounded, reddish-brown, shiny spot, not touching eyes, in middle of which lies a distinct ocellar tubercle of same color; hair of vertex and frons black; subcallus dark yellowish brown, with black hair. First two antennal segments yellowish brown, with black hair; third orange, the annulate portion black and basal portion sometimes darkened apically; basal portion



moderately broad at base, the dorsal angle distinct, but dorsal excision not very pronounced; apical portion about equal in length to width of basal portion. Clypeus and genae yellowish gray, with concolorous hair. Second palpal segment moderately stout, but not strongly swollen basally, yellowish brown, with black hair. Proboscis black, short, but little longer than palpus.

Thorax mostly black or very dark brown, with brown hair; humeral and prescutal lobes orange brown; mesonotum rather shiny, the pollinose lines not very distinct. Wing hyaline, with brown veins, the costal cell weakly infuscated; venation normal. Legs dark orange brown, fore femur, basal half of hind femur, apical half of fore tibia, and fore tarsus black; hind tibial fringe black.

Abdomen above orange brown, with a narrow, median, black stripe widening on tergite 4; tergites 5-7 mostly black; each tergite with a narrow posterior margin of yellow pollen and hair; venter orange, with concolorous hair, the apical sternites blackened.

*Male*.—Unknown to the writer but, according to Hine, "The male is like the female. The antennae are red with the exception of the apical portion of the third segment, which is more or less black. The frontal triangle is covered with silvery pollen."

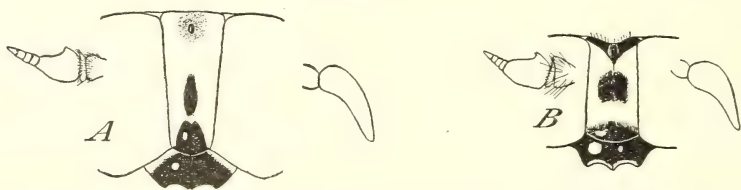


FIGURE 67.—Antenna, front view of head, and palpus of (A) *Tabanus captonis* and (B) *T. oklahomensis*.

*Type*.—Female, lost.

*Type locality*.—California.

*Distribution*.—British Columbia to California and Montana. June (Los Angeles, Calif.) to August 27 (Chenook Pass, Wash.). In the United States National Museum, 18 females.

Hine studied the type of *Tabanus recedens* Walker, 1854, which is a homonym of that described by Walker in 1848, and found it to be the same as *captonis*.

#### TABANUS OKLAHOMENSIS Stone

(Fig. 67, B)

*Tabanus oklahomensis* Stone, Ent. Soc. Wash. Proc. 35: 76-77, 1933.

Rather small, stout; brownish black; frons very broad; basal callus transverse; subcallus shiny black; palpus stout, white.

*Female*.—Length 13-15 mm. Eye with short, dense, white pile, dark purple, with four green-blue diagonal stripes not touching eye margin laterally and the lower three curved upward at outer end; eye transverse and short dorsoventrally, the angle formed by lower margin of eyes wider than usual. Frons very broad, sometimes less than twice as high as wide and never more than two and one-half times the width, the sides nearly or quite parallel; pollen of frons yellowish brown, paler between median and basal calli; hair downward pointing, black except just above basal callus, where it is creamy white; vertex somewhat concave, with a shiny-black triangle, in the middle of which lies a sharply defined, raised, dark-reddish ocellar tubercle; a slender black line from ocellar tubercle to basal callus; on each side of this line, on middle of frons, a large black spot, either separated from the line or broadly joined to it; basal callus black, wrinkled, transverse, somewhat protuberant, tapering somewhat to each side but touching eyes; line between basal callus and subcallus distinctly curved downward medianly; subcallus swollen and shiny black, with a median depressed line; semicircles above antennal bases with pale-yellow pollen.

First antennal segment stout and somewhat enlarged apically, gray, with pale yellowish and black hair and a distinct tuft of reddish hair at apex above; third rather stout, with a strong dorsal angle and distinct dorsal excision; basal third to half of basal portion dark reddish brown to nearly black, the rest black; annulate portion stout, about equal in length to width of basal portion at dorsal angle. Clypeus, genae, and back of head pale yellowish gray, with abundant, long, nearly white hair; posterior orbital fringe of hair, to each side of vertex for a short distance, distinctly yellowish orange. Second palpal segment short, stout, swollen at base, and coming to a sharp apex, pale yellow, with long, nearly white hair. Proboscis very short, the labellae black.

Mesonotum black, with abundant, long, silky, pale-yellowish or brownish hair; prescutal lobe black, with shorter black hair. Pleura, sternum, and coxae gray, densely clothed with long, nearly white hair. Wing hyaline, with black veins, the costal cell often somewhat infuscated; venation normal. Legs with femora black, the under surface, particularly of fore femur, with abundant, long, yellowish hair; tibiae dark reddish, the fore tibia with apex black; all tibiae with a mixture of pale and black hair; hind tibial fringe not prominent; tarsi black, the ventral surface with short bright-orange hair.

Abdomen above broad, black, with pale-yellowish and black hair, the pale hair forming rather indefinite posterior margins to the tergites; these bands expand at lateral margins of each tergite and sometimes form faint median triangles; venter gray, the posterior margin of sternites somewhat paler.

*Male*.—Eye densely pilose, the facets nearly uniform in size; a row of heavy black hairs between eyes; frontal triangle protuberant, with gray pollen; first antennal segment very stout, grayish, with long black hair; third black except at extreme base; second palpal segment stout, pale yellowish, with concolorous hair. Legs black, the tibiae yellowish; outer claw of fore tarsus distinctly longer than inner claw, the basal half distinctly pilose below. Abdomen dull blackish, with a pale spot at lateral margin of second sternite.

Described from a topotype in the American Museum of Natural History, collected by A. E. Pritchard, April 26, 1934.

*Type*.—Female, United States National Museum No. 49377. Paratypes, United States National Museum No. 49377.

*Type locality*.—Atoka, Okla.

*Distribution*.—Johnson and Atoka Counties, Okla., March 31 to April 26 (Atoka). In the United States National Museum, 17 females.

The presence, in the male, of coarse hair between the eyes further confirms the relationship of this species to *carolinensis*.

This interesting species occurs in considerable abundance in a very local area and for a relatively short period early in the spring. It has been studied by Sanborn in connection with its possible transmission of anaplasmosis of cattle.

#### TABANUS SEXFASCIATUS Hine

(Fig. 68, A)

*Tabanus sexfasciatus* Hine, Canad. Ent. 55: 144, 145, 1923; Stone, Ent. Soc. Wash. Proc. 37: 18, 1935.

*Tabanus borealis* authors (not Fabricius).

Rather small; blackish, with narrow, posterior, pale bands on tergites; palpus slender; black hair on hind tibia.

*Female*.—Length 13–14 mm. Eye densely pilose, coppery, with four blue bands, the ventral one margining bottom of eye. Frons, subcallus, clypeus, and genae gray, occasionally with a faint tinge of yellow; frons black haired, about two and one-half times as high as width at base, with nearly parallel sides; basal callus somewhat transverse, nearly touching eyes, dark reddish brown to black; median callus spindle shaped, black, usually connected to basal callus and sometimes joined to ocellar tubercle by a dark line; ocellar tubercle prominent, sharply defined, reddish brown. First two antennal segments black, with black hair, the first somewhat expanded apically and about twice as long

as second; third reddish brown to nearly black, paler basally, with a moderate, obtuse, dorsal angle; annulate portion stout, slightly larger than width of basal portion. Clypeus and lower genae with pale-yellowish hair. Second palpal segment rather slender, tapering, yellowish brown to nearly black, with long yellowish and black hair.

Thorax black, clothed with rather long grayish and black hair. Wing hyaline, with brown veins; costal cell and stigma brown, a brownish tinge along some of the longitudinal veins and central cross veins, and a faint spot at furcation. Legs dark brown to black, the bases of tibiae, particularly of the middle tibia, brownish.

Abdomen rather stout, black, with narrow yellowish bands on hind margins, with yellow hair; occasionally reddish on side of second tergite; faint indications of median grayish triangles on tergites 2-4, that on the second most distinct.

*Male*.—Eye densely pilose, with the areas of large and small facets weakly differentiated; hair of clypeus, genae, and palpus black. Outer claw of fore tarsus distinctly larger than inner claw. Rest of coloration essentially as in female.

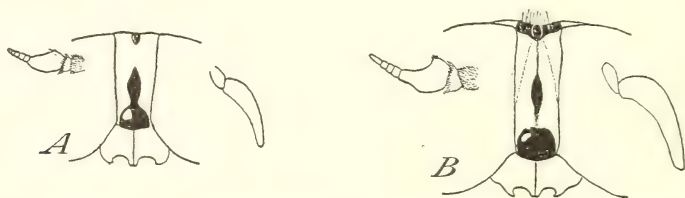


FIGURE 68.—Antenna, front view of head, and palpus of (A) *Tabanus seafasciatus* and (B) *T. zonalis*.

*Type*.—Female; United States National Museum No. 26823. Paratypes, eight specimens, United States National Museum No. 26823.

*Type locality*.—Camp 334, near Fairbanks, Alaska.

*Distribution*.—Holarctic from central Europe to Siberia, Alaska, and Labrador. June 11 (Mount McKinley National Park, Alaska) to July 19 (Golovin, Alaska). In the United States National Museum: Nearctic, 25 females, 1 male; Palearctic, 6 females, 1 male.

#### TABANUS ZONALIS Kirby

(Fig. 68, B)

*Tabanus zonalis* Kirby, Fauna Boreali-Americana, v. 4, p. 314, 1837; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 463-464, 1876; Smithsn. Misc. Collect. No. 270, pp. 56, 226, 1878; Bethune, Canad. Ent. 13: 167, 1881 (compiled from Kirby); Hine, Ohio Nat. 5: 244-245, 1904; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 118-119, 1931; Fairchild, Boston Soc. Nat. Hist. Occas. Papers 8: 139, 1934; Philip, Bull. Brooklyn Ent. Soc. 31: 196, 1936.

*Theriopectes zonalis* Townsend, Amer. Ent. Soc. Trans. 22: 58, 1895.

*Tabanus tarandi* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 156, 1848.

*Tabanus terrae-novae* Macquart, Diptères exotiques nouveaux ou peu connus, sup. 4, p. 339, 1850.

*Tabanus flavocinctus* Bellardi, Saggio di ditterologia messicana, pt. 1, p. 61, 1859.

Medium sized; black, with broad yellow bands on abdomen; prescutal lobe reddish; hind tibia orange.

*Female*.—Length 17-18 mm. Eye pilose, purple, with four green stripes. Frons yellowish gray, about three and one-half times as high as width at base, slightly widened above; ocellar tubercle prominent, yellowish brown or reddish, the vertex behind it shiny black; median callus black, lanceolate; basal callus shiny dark reddish or black, subquadrate, rounded above; usually narrowly



joined to median callus and often a slender black line running from ocellar tubercle to median callus and a pair of lines from ocellar tubercle to sides of frons opposite median callus; subcallus, clypeus, and genae yellow; genae with black hair. Antenna orange, the annulate portion dark orange to black; first two segments with black hair; third with a distinct angle at base and a rather deep excision; annulate portion shorter than basal portion. Second palpal segment rather slender, dark yellowish brown to black.

Thorax black, with black and some yellowish-brown hair; prescutal lobe reddish. Wing hyaline, the costal cell strongly yellowish brown and all veins faintly margined with same color; sometimes a short stump from vein R<sub>4</sub>. Coxae, femora, except extreme apex of middle and hind femora, apex of fore tibia, and fore tarsus black, the rest yellow; hind tibial fringe prominent, entirely yellow.

Abdomen black, with broad bands of bright-yellow pollen on hind margins of tergites, and hair above and below; on second and third tergites these bands sharply narrowed on median third, resulting in short, anterior-projecting angles on each side.

*Male*.—Coloration as in female, the abdominal bands slightly narrower. Facets of upper part of eye only slightly larger than lower ones, the line of differentiation scarcely visible.

*Type*.—Sex and collection unknown.

*Type locality*.—Latitude 65°, Canada.

*Distribution*.—British Columbia and Northwest Territory to Newfoundland and south to Washington, Michigan, and New Jersey. May 21 (Springfield, Mass.) to August 24 (St. Johns, Newfoundland). In the United States National Museum, 15 females, 2 males.

The type locality of *flavocinctus* is Mexico, but Osten Sacken saw the type and declared it to be *zonalis*, and the writer agrees with him in considering the locality label to be probably erroneous.

#### TABANUS AEQUETINCTUS Becker

(Fig. 69, A)

*Tabanus flavipes* Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, pp. 137–138, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 462–463, 1876; Brauer, Denkschr. K. Akad. Wiss. Wien 42: 141–142, 1880; Graenicher, Wis. Nat. Hist. Soc. Bull. (n. s.) 10: 174, 1913; Kröber, in Lindner, Die Fliegen der Palaearktischen Region, Lfg. 6, p. 64, 1925. (Preoccupied by *Tabanus flavipes* Gravenhorst.)

*Tabanus aequetinctus* Becker, Act. Soc. Sci. Fennicae 26 (9): 8–9, 1900.

*Tabanus nigrotuberculatus* Fairchild, Boston Soc. Nat. Hist. Occas. Papers 8: 139, 1934. (New synonymy.)

Medium sized, stout; blackish, with bands of pale-yellow hair on abdomen; prescutal lobe black; hind tibia yellow.

*Female*.—Length 15–18 mm. Eye deep purple, with four diagonal green-blue bands and dense, short, brown pile. Frons about three times as high as width at base, decidedly widened above, yellowish gray, with black hair; ocellar tubercle usually not sharply defined, reddish, surrounded by a black denuded area; basal callus convex, square or slightly wider than high, with a small, linear, median callus attached above, surrounded by a darkened area; subcallus usually denuded, shiny reddish black, the semicircle immediately above antennal pits with yellow pollen. Antenna dark reddish, paler on base of third segment; first two segments with black hair; basal portion of third stout, the dorsal angle near base, prominent, dorsal excision pronounced, and ventral surface rather distinctly argulate. Clypeus and genae dark gray, with yellowish or grayish hair. Second palpal segment slender, dark brown to black, with black hair.

Thorax, including prescutal lobe, black, with black hair; some yellowish hair on pleura. Wing hyaline, the costal cell, veins, and vein margins of fore part of wing brown; venation normal, rarely a stump vein from vein R<sub>4</sub>. Legs orange and black, the orange on base of fore tibia, apex of middle and hind femora, and middle and hind tibiae and tarsi; hair concolorous with part of leg from which it arises; hind tibial fringe prominent, entirely orange.

Abdomen black, the hind margins of segments on both dorsum and venter narrowly yellow, with yellow hair which is scattered over the black to some extent; often a reddish spot on side of second tergite; no indication of pale triangles.

*Male*.—Osten Sacken described what he took to be the male but the writer has not seen the specimen. He wrote, "The sides of the second abdominal segment are reddish. The head is moderately large, and the difference between the large and small facets well marked, although not very considerable."

*Types*.—Three female cotypes in the Helsingfors Museum and the Becker collection.

*Type locality*.—Plakina and Kureika, northwestern Siberia.

*Distribution*.—Western Siberia and North America from Wisconsin to Labrador. June 12 (Hopedale, Labrador) to September 5 (Kangalasiorkvik Bay, Labrador). In the United States National Museum, 37 females.

This species has commonly been called *Tabanus flavipes* Wiedemann, both in this country and in Europe, but Fairchild pointed out the

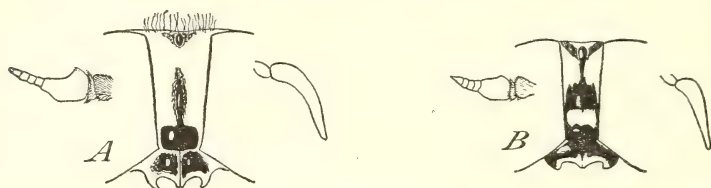


FIGURE 69.—Antenna, front view of head, and palpus of (A) *Tabanus aequitinctus* and (B) *T. longiglossus*.

previous use of the name by Gravenhorst and proposed the name *nigrotuberculatus*. Kröber, however, had previously placed *T. aequitinctus* Becker as a synonym of *T. flavipes* Wiedemann, and since there appears no reason to doubt the synonymy, Becker's name should be used. It is strange that this species has not been collected in Alaska.

#### TABANUS LONGIGLOSSUS Philip

(Fig. 69, B)

*Tabanus longiglossus* Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 110-111, 1931; Fairchild, Boston Soc. Nat. Hist. Occas. Papers 8: 143, 1934.

Rather small, stout; abdomen mostly black, with some dull reddish laterally; eye pilose; subcallus denuded; palpus very slender.

*Female*.—Length 12-14 mm. Eye densely pilose, purple, with four green stripes, the upper one widest. Frons two and one-half to three times as high as width at base, slightly widened above; pollen of entire head grayish; basal callus dark brown, transverse, with narrow extensions upward along margin of eye; median callus narrow, irregular, not joined to basal callus but with a narrow extension to ocellar tubercle and with an irregular denuded area to each side extending to eye; ocellar tubercle prominent, orange brown, surrounded by an extensive, black, denuded area; subcallus blackish brown, denuded except for a pollinose band surrounding antennal pits. First two antennal segments orange brown, with gray pollen and black hair; second with distinct dorsal process; third dull orange brown, the annulate portion somewhat darkened; basal portion stout, about length of annulate portion, with the dorsal angle very obtuse and with no dorsal excision; annulate portion stout, the annuli distinct. Clypeus and genae black, with thin gray pollen and whitish hair, the middle of clypeus usually denuded. Palpus with first segment blackish brown, second yellow brown, the latter extremely slender, with a mixture of short black and yellowish hair. Proboscis elongate, the tip of palpus just reaching to base of elongate labellae.

Dorsum of thorax subshiny, black, with indistinct grayish stripes in usual pattern; prescutal lobe orange. Pleura, sternum, and coxae with thin grayish pollen and mostly whitish hair. Wing hyaline, the costal cell and base of wing yellowish brown; venation normal. Legs orange brown, the bases of femora and the tarsi somewhat darker; hind tibial fringe stout, black.

Abdomen blackish, subshiny, the posterior margins of the segments with narrow light-yellowish-brown bands of pollen and pile and the dorsum more or less extensively dull reddish on sides of first three tergites, this sometimes very faint; venter occasionally reddish.

*Male*.—Eye pilose, the facets nearly uniform in size; subcallus somewhat protuberant, pollinose gray; pollen of clypeus and genae tinged with yellow, the middle of clypeus not denuded; palpus very small, the two segments subequal and second segment flattened above, convex below; proboscis reaching beyond end of fore coxa. Body coloration essentially as in female, the prescutal lobe and legs somewhat darker.

Described from a male in the collection of the Boston Society of Natural History from Nantucket, Mass., June 8, collected by C. W. Johnson.

*Type*.—Female, in the collection of the University of Minnesota.

*Type locality*.—McGregor, Minn.

*Distribution*.—Minnesota to Newfoundland and Massachusetts. June 8 (Nantucket, Mass.) to July 15 (Little River, Codroy, Newfoundland). In the United States National Museum, one female.

This species resembles *Tabanus seafasciatus* to a considerable extent, but the denuded subcallus of the female and the very small palpus of the male will serve to distinguish *longiglossus*.

#### TABANUS MINUSCULUS Hine

(Fig. 70, A)

*Tabanus minusculus* Hine, Ohio Nat. 8: 226–227, 1907; McDunnough, Canad. Ent. 53: 142, 1921; Stone, Ann. Ent. Soc. Amer. 23: 297–298, 1930.

Small; three rows of pale triangles on abdomen and side suffused with orange brown; subcallus pollinose; palpus very slender; third antennal segment scarcely excised above.



FIGURE 70.—Antenna, front view of head, and palpus of (A) *Tabanus minusculus*, (B) *T. hearlei*, and (C) *T. astutus*.

*Female*.—Length 10–12 mm. Eye pilose, with three purple bands. Frons gray or brownish, about three times as high as width at base, tending to be slightly wider at middle than above or below; basal callus dark brown to black, somewhat convex, square or slightly wider than high, usually broadly joined to median callus, which tapers to a thin line reaching to the yellowish, well-defined, oval, ocellar tubercle; often a pair of thin, outwardly curved, denuded, dark lines running from upper outer corners of basal callus to ocellar tubercle; subcallus yellowish brown covered with gray pollen. Antenna orange, the annulate portion darker; first two segments gray, with black hair; basal portion of third with scarcely any dorsal prominence and no dorsal excision; annulate portion rather stout, about equal to basal portion in length. Clypeus and genae yellowish gray, with white hair except on upper genae, which bear sparse black hair. Second palpal segment dark yellowish brown, elongate, very slender, tapering and only slightly curved at base, with black hair.

Mesoscutum black, with yellowish-brown pollen on three slender dorsal lines and a broader lateral stripe starting on humeral lobe and reaching back to postalar lobes, leaving a dark longitudinal streak above wing base; prescutal



lobe reddish; scutellum black; hair of thoracic dorsum a mixture of black and yellow. Pleura brown, with whitish and black hair; sternum black. Wing hyaline, the veins brown; venation normal; costal cell somewhat tinged with brown, the vein margins slightly tinged but without distinct spots. Legs dark orange brown; base of hind femur and all tarsi darker, but legs not markedly bicolored; hind tibial fringe black.

Abdomen black, with a sublateral row of oblique yellowish spots on a brownish background and a median row of rather faint triangles composed mostly of yellow hair; venter yellowish brown, usually with some black laterally and apically.

*Male*.—Eye densely pilose, the facets scarcely differentiated in size; second palpal segment dusky orange brown, nearly twice as long as thick, the apex blunt. Coloration essentially as in female but femora darker, and black on abdomen somewhat less extensive.

*Cotypes*.—Females and male, in the collection of Ohio State University. Three specimens in the United States National Museum are probably of the cotype series.

*Cotype localities*.—Orono, Maine; Oswego, N. Y.; Springfield, Mass.; Canada.

*Distribution*.—Wisconsin to Nova Scotia and south to West Virginia. June 26 (Ottawa, Ontario) to August 11 (Heartwellville, Vt.). In the United States National Museum, 10 females.

#### TABANUS HEARLEI Philip

(Fig. 70, B)

*Tabanus hearlei* Philip, Canad. Ent. 68: 150, 1936.

Rather small, stout; blackish, with three rows of gray spots on abdomen; palpus very slender; proboscis unusually long.

*Female*.—Length 11–12 mm. Eye pilose, deep purple, with four green-blue bands. Frons gray tinged with yellowish, about two and one-half times as high as wide, with parallel sides; basal callus shiny black, slightly wider than high but not touching eyes, median callus tapering, broadly joined to basal callus; ocellar tubercle orange brown, distinct; subcallus gray. First antennal segment dark gray, with black hair; second dull orange brown, with a distinct dorsal process; third dark orange basally, blackened apically, the dorsal angle short and blunt and the dorsal excision moderate; annulate portion shorter than basal portion. Clypeus and genae gray tinged with yellow, with a mixture of black and yellowish hair. Palpus yellowish brown, the first segment darker and both segments very slender, with black and yellowish hair. Proboscis very elongate, reaching to or beyond apex of fore coxa.

Thorax black, with mixed black and yellowish hair, the dorsum with five narrow gray stripes. Wing hyaline, costal cell brownish and venation normal. Legs brownish black, the mid tibia palest.

Abdomen above black, with three rows of gray triangles, the triangles rarely extending to anterior margins of tergites; venter black, with pale-yellowish hair.

*Male*.—Unknown.

*Type*.—Female, in the collection of C. B. Philip. Paratype, United States National Museum No. 51972; other paratypes in the collection of Ohio State University and in the Canadian National Collection.

*Distribution*.—British Columbia to Labrador. July 12 (Kettle Rapids, near Winnipeg, Manitoba) to July 18 (Birch Island, British Columbia). In the United States National Museum, one female.

#### TABANUS ASTUTUS Osten Sacken

(Fig. 70, C)

*Tabanus astutus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 471, 1876; Philip, Canad. Ent. 68: 153–154, 1936.

Rather small; black, with three rows of prominent gray spots on abdomen; prescutal lobe black; palpus slender.

*Female*.—Length 12–15 mm. Eye finely pilose, deep purple, with four green-blue bands, the two middle ones considerably narrower than other two or purple band between them. Frons about two and one-half times as high as width at base, slightly narrowed at basal callus, gray or yellowish gray, with black hair; basal callus square or slightly wider than high, convex, shiny black or dark brown, usually as wide as frons; median callus slender, about equal in height to basal callus and usually separated from it; ocellar tubercle prominent, orange brown to black; subcallus, clypeus, and genae gray tinged with yellow, the hair yellowish gray. First two antennal segments black, with gray pollen and black hair; third black to dark brown, more or less orange on basal portion, which is of medium width, only slightly excised above, the dorsal angle obtuse; annulate portion rather stout, shorter than basal portion. Second palpal segment rather slender, dark yellowish brown, with long black hair and a few scattered pale hairs near base.

Mesoscutum nearly black, with longitudinal lines of gray pollen and yellowish hair; prescutal lobe and scutellum black. Pleura, sternum, and coxae gray, with grayish and black hair. Wing nearly hyaline; costal cell scarcely darker; base of vein  $R_4$  occasionally with a short stump; furcation with a very faint spot. Legs dark brown to black; fore tibia at base and middle and hind femora and tibiae usually with some yellowish hair; hind tibial fringe black.

Abdomen above black, with three distinct gray triangles on hind margin of each tergite; each sublateral spot oblique, with outer angle produced toward lateral margin and there widened; median triangles quite prominent; venter yellowish gray, with paler incisures.

*Male*.—Eye densely pilose, the facets not sharply differentiated into two sizes. General coloration as in female but body somewhat darker and abdominal spots smaller and somewhat reddish. Costal cell of wing somewhat infuscated and brown stigmal spot prominent. Abdomen rather peculiarly shaped, being parallel-sided for the first four segments and then coming rather sharply to a point.

*Type*.—A female cotype labelled “White Mts.” in the Museum of Comparative Zoology, No. 4029, labelled and herein designated as lectotype. Of the other four cotypes, one from western New York is conspecific while the other three, two from Southington, Conn., and one from North Conway, N. H., are not the same, but are *Tabanus typhus* Whitney.

*Type locality*.—White Mountains, N. H.

*Distribution*.—British Columbia to Labrador and New Hampshire. July 17 (Lake Nipigon, Ontario) to September 1 (base of Mount Washington, N. H.). In the United States National Museum, 17 females.

#### TABANUS BOREUS, new species

(Fig. 71, A)

Medium sized; black, with three rows of gray spots on abdomen; antenna black; palpus rather slender.

*Female*.—Length 15 mm. Eye pilose. Frons gray, with black hair above, whitish hair below, nearly two and one-half times as high as width at base, with nearly parallel sides; basal callus chestnut brown, nearly twice as wide as high, not quite touching eyes; median callus small, irregular, connected with basal callus by narrow line; ocellar tubercle large, yellowish brown. Subcallus, clypeus, and genae concolorous with frons; clypeus and genae with white hair. First two antennal segments dark gray, with mixed black and white hair; third black, the basal portion slender, with low, obtuse dorsal angle and no dorsal excision. Palpus creamy white, with long white hair; second segment slender, with a few scattered black hairs.

Mesonotum, including prescutal lobe, black, an indication of five gray lines on anterior margin; type specimen with humerus and region above wing base tinged with brownish; in paratype the humerus dark. Pleura, sternum, and coxae black, the hair mostly white. Wing entirely hyaline, with dark-brown veins; venation normal. Legs brownish black, the tibiae somewhat lighter than the femora; hind tibial fringe concolorous with tibia, the hairs long but irregular.

Abdomen black, with three rows of gray spots above and incisures, both above and below, narrowly grayish; spots rather indistinct, the median triangle or tergite 2 large, reaching nearly to anterior margin, the sublateral spots reaching about half way; venter with white hair.

*Male*.—Unknown.

*Type*.—A female, United States National Museum No. 51973. Paratypes, females, United States National Museum No. 51973.

*Type locality*.—Longitude  $141^{\circ}$ , latitude  $69^{\circ}10'$ , Alaska.

Both specimens were collected August 14–17, 1912, by J. M. Jessup. The paratype was determined by Hine as *Tabanus osburni*, from which it differs in its pollinose subcallus, yellowish ocellar tubercle, brownish basal callus, and entirely hyaline wing.



FIGURE 71.—Antenna, front view of head, and palpus of (A) *Tabanus boreus* and (B) *T. typhus*.

#### TABANUS TYPHUS Whitney

(Fig. 71, B)

*Tabanus typhus* Whitney, Canad. Ent. 36: 206, 1904; Bequaert, Boston Soc. Nat. Hist. Occas. Papers 8: 87, 1933; Philip, Canad. Ent. 68: 154, 1936.

Rather small; black, with three rows of gray spots on abdomen, often tinged with reddish laterally; prescutal lobe reddish; antenna brownish or orange, the base of third segment rather stout; subcallus pollinose; palpus rather slender, with short hair.

*Female*.—Length 10–13 mm. Eye sparsely pilose, deep purple, with four green-blue bands, upper one slightly wider than others and two middle ones about equal in width to intervening purple band. Frons gray tinged with yellowish brown, two and one-half to three times as high as width at base, slightly widened above; basal callus subquadrate, shiny, dark orange brown to black, and narrowly separated from eyes; median callus black, short, narrow, tapering at both ends and usually not connected with basal callus; ocellar tubercle orange brown, distinct; subcallus gray. Antenna orange brown, the annulate portion and apical part of basal portion of third segment darkened; first segment small, with black hair; basal portion of third with a distinct dorsal angle, the dorsal excision slight, its width about four-fifths its height; annulate portion stout, slightly shorter than basal portion. Clypeus and genae gray, with white hair. Second palpal segment rather slender, creamy white, with short black and white hair. Proboscis slightly longer than palpus.

Mesonotum black, dark grayish on sides and below, at least the prescutal lobe tinged with reddish and the mesoscutum with five slender gray lines; hair on pleura mixed black and white. Wing hyaline, the costal cell brownish and veins often margined basally with brown and a faint spot at furcation. Legs black, except for middle and hind tibiae and base of fore tibia, which are tinged with orange brown.

Abdomen above black, with three rows of gray triangles, the median one on second tergite occasionally reaching anterior margin, the others not extending over half way; sublateral, oblique triangles often tinged with reddish; gray hind margins of tergites very narrow; venter dark gray, with narrow light-gray incisures.

*Male*.—Eye densely pilose, the areas of large and small facets rather distinctly differentiated; palpus slender, orange brown. Body coloration essentially as in female.

*Type*.—Specimen collected July 8, one of two cotype females in the Museum of Comparative Zoology, No. 17060, herein designated



as the lectotype. Three cotype females, Boston Society of Natural History.

*Type locality*.—Milford, N. H.

*Distribution*.—British Columbia and New Brunswick south to Montana and Maryland. May 21 (Mount Lehman, British Columbia) to August 27 (Fort George, James Bay, Quebec). In the United States National Museum, 29 females, 3 males.

**TABANUS TRISPILUS Wiedemann**

(Fig. 72, A)

*Tabanus trispilus* Wiedemann, Aussereuropäische zweiflügelige Insekten, v. 1, pp. 150–151, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 464–465, 1876; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 34, 118, 1931.

*Tabanus sodalis* Williston, Kans. Acad. Sci. Trans. 10: 139, 1887. (New synonymy.)

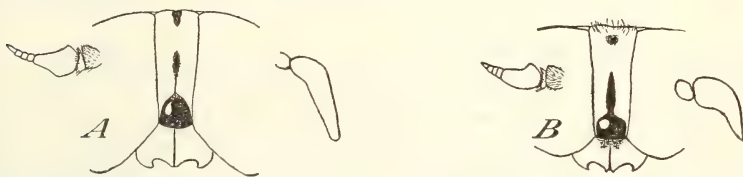


FIGURE 72.—Antenna, front view of head, and palpus of (A) *Tabanus trispilus* and (B) *T. illotus*.

Medium sized; abdomen with a prominent middorsal row of white triangles; wing subhyaline to dark brown.

*Female*.—Length 13–16 mm. Eye purple, with four bright-green bands and short, fine pile. Frons gray tinged with yellow, about three and one-half times as high as width across basal callus, with parallel sides; basal callus chestnut brown to black, square or slightly transverse, rounded above and not touching eyes; median callus concolorous with basal callus, slender, tapering at both ends, somewhat longer than basal callus and only rarely connected with it; a well-defined, orange, ocellar tubercle at vertex; subcallus, clypeus, and genae gray, the supraantennal crescents strongly tinged with orange; some black hair on clypeus, the genae below with yellowish hair. First and second antennal segments orange, with black hair, the first often with gray pollen; basal portion of third orange brown, usually blackened apically and dorsally beyond dorsal angle, which is distinct, the excision moderate; annulate portion black, shorter than basal portion. Second palpal segment creamy white to yellowish, with concolorous and black hair, moderately stout at base and tapering to a blunt apex.

Mesonotum blackish, with faint gray lines in usual pattern; prescutal lobe black to reddish brown. Pleura, sternum, and coxae dark gray, with mostly yellowish hair. Wing more or less strongly tinged with orange brown, in some specimens almost black. Legs generally brownish black, the middle tibia and base of fore tibia palest.

Abdomen above black, with a median row of white spots consisting of a very small one on first tergite, a large triangle on second reaching length of tergite, and somewhat smaller ones on 3 and 4, which are narrower but reach length of tergites; tergite 5 without or with only a minute spot; very narrow, white, posterior borders on tergites 2–4 or 2–5; venter gray, with a broad median band of dark brown.

*Male*.—Eye with dense, short, gray pile; facets almost uniform in size. Palpus yellowish orange, with black hair. Thorax and legs blacker than in female, the hair of pleura, except that below wing base, black. Sides of tergites 2–4 tinged with orange; no white spot on first tergite; triangles on tergites 2 and 3 broad but usually not reaching anterior margin, that on tergite 4 very small; venter mostly dark, so the median stripe is usually indistinct.

*Type*.—A male, in the Vienna Museum.

*Type locality*.—Kentucky.

*Distribution*.—Minnesota to Quebec and Maine and south in the east to Georgia. June 5 (Southern Pines, N. C.) to August 28 (Hopkins, Minn.). In the United States National Museum, 42 females, 21 males.

Williston describes the eyes of *Tabanus sodalis* as being bare. In every other respect the description fits *T. trispilus* perfectly, and since the pile is very short and fine in this species and easy to overlook, there is no reason for doubting the synonymy.

#### TABANUS ILLOTUS Osten Sacken

(Fig. 72, B)

*Tabanus illotus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 469–470, 1876; Hine, Ohio Nat. 5: 238, 1904; Cameron, Bull. Ent. Research 17: 28–29, 1926; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 32–33, 107–108, 1931.

Rather small; blackish, with round, grayish, sublateral spots on tergites 2 and 3 and small median triangles, the spots behind evanescent; palpus stout.

*Female*.—Length 12–14 mm. Eye with dense, short pile, purple, with three green cross bands. Frons grayish tinged with yellow brown, three and one-half times as high as width across basal callus, distinctly widened above; a distinct ocellar tubercle; basal callus shiny brown to black, nearly square; median callus rather short and narrow, sometimes separated from basal callus; subcallus gray. First two antennal segments orange brown, with black hair; third orange basally, tinged with black above, the annulate portion black; dorsal angle short, obtuse, and dorsal excision moderate; annulate portion short, stout, about equal in length to greatest width of basal portion. Clypeus and genae gray, with nearly white hair. Second palpal segment stout at base, cream colored, with short black hair.

Mesonotum nearly black, with gray lines in usual pattern; prescutal lobe and region around wing reddish. Pleura, sternum, and coxae mostly gray, with whitish hair. Wing hyaline, with dark-brown veins, the venation normal; faint brown spots at furcation and cross veins. Femora gray; tibiae reddish brown, with pale hair, darker apically; hind tibial fringe slight, largely white; tarsi dark brown to black.

Abdomen above black, with three rows of gray spots, sometimes tinged with reddish; a small, but distinct, narrow triangle on second tergite and very faint spots on others; the sublateral row consisting of a large round spot on second tergite usually not touching any margin, a somewhat smaller round spot on third tergite, and very faint spots posterior to these; venter black, often with considerable areas of reddish brown.

*Male*.—Facets of eye nearly uniform in size, the larger facets not sharply differentiated from the smaller; first antennal segment gray; second palpal segment stout, rounded at tip. Legs darker than in female, the hind tibia entirely black. Abdomen with very small median spots, the sublateral spots on tergites 2 and 3 large, orange brown, confluent, but narrowly separated from lateral margin.

*Type*.—A specimen from Hudson Bay Territory, 1 of 10 cotype females in the Museum of Comparative Zoology, No. 4027, herein designated as the lectotype. One of the 10 cotypes is actually *Tabanus nivosus* Osten Sacken.

*Type locality*.—Hudson Bay Territory.

*Distribution*.—Alaska to Quebec and south to Washington, Iowa, and New York. May 28 (Point Pelee, Ontario) to July 27 (Aweme, Manitoba). In the United States National Museum, 21 females, 4 males.

## TABANUS METABOLUS McDunnough

(Fig. 73, A)

*Tabanus metabolus* McDunnough, Canad. Ent. 54: 239, 1922; Hine, Canad. Ent. 55: 145, 1923; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 111, 1931.

Rather small, stout; blackish, with oblique, yellowish, sublateral spots on tergites 2 and 3; furcation with a rather distinct brown spot; prescutal lobe orange brown; basal callus denuded; palpus stout, pale; third antennal segment rather stout, with a moderate dorsal excision.

*Female*.—Length 12–14 mm. Eye pilose, deep purple, with four green bands. Frons yellowish gray, about three times as high as width at base, considerably widened above; basal callus dark orange brown, small, rugose, subquadrate or transverse, and, if touching eyes, only at lower corners of callus; median callus black, flat, not very shiny, the margins ill defined and usually narrowly joined to basal callus; ocellar tubercle orange brown, small but well defined; subcallus denuded, shiny brown, rather convex. First antennal segment gray, with black hair; second and third orange, darkened beyond dorsal angle of third; basal portion of third with a prominent but blunt dorsal angle and a moderate exci-



FIGURE 73.—Antenna, front view of head, and palpus of (A) *Tabanus metabolus* and (B) *T. laniferus*.

sion, the annulate portion slightly shorter than width of basal portion. Clypeus and genae pale gray, with pale-yellowish hair. Second palpal segment creamy white, with black and concolorous hair, very stout at base, short, with an acute apex.

Mesonotum black, with slender gray stripes in usual pattern and orange-brown prescutal lobe. Pleura, sternum, and coxae dark gray, with a mixture of black and yellowish hair. Wing hyaline, the costal cell brown and a small spot at furcation; venation normal. Legs nearly black, the tibiae and hind tarsus strongly tinged with brown.

Abdomen black; tergites 2–4 somewhat orange brown laterally, each with a rather large, oblique, superimposed, grayish-yellow spot sublaterally and sometimes smaller ones on tergites posteriorly; a median row of very small obsolete spots of same color; venter dark but sometimes with considerable yellowish brown.

*Male*.—Eye densely pilose, the areas of large and small facets scarcely differentiated. Coloration essentially as in female.

*Type*.—A female in the Canadian National Collection. Allotype and paratypes in the Canadian National Collection; two paratypes in the Museum of Comparative Zoology.

*Type locality*.—Nordegg, Alberta.

*Distribution*.—Alaska to Labrador and south to Colorado and New York. April 13 (Pendleton, British Columbia) to August 16 (Mokkovik, Labrador). In the United States National Museum, 17 females, 2 males.

## TABANUS LANIFERUS McDunnough

(Fig. 73, B)

*Tabanus laniferus* McDunnough, Canad. Ent. 54: 239–240, 1922; Philip, Canad. Ent. 68: 153, 1936.

Rather small, stout; shiny black, with very faint, if any, abdominal markings; wing hyaline; some black pile on subcallus.

*Female*.—Length 13–14 mm. Eye densely pilose, greenish, with three very slender purple bands. Frons about two and one-half times as high as width at



base, gray or yellowish gray, with black hair; basal callus transverse, black, rather convex; median callus black, oval; ocellar tubercle indefinite, the whole vertex somewhat swollen; subcallus gray, with distinct black hair. Antenna black; first two segments with long black hair; basal portion of third rather slender, the dorsal angle very small; annulate portion rather stout, about three-fourths length of basal portion. Clypeus and genae gray, with black hair, and a strong fringe of yellow hair below. Palpus dark reddish, the first segment with long black and yellow hair, the second rather slender, with short black hair.

Thorax entirely black, with long black hair and a few yellow hairs above and below wing base. Wing hyaline, the costal cell slightly tinged with brown; venation normal. Legs black, the tibiae slightly reddish; hind tibial fringe long, black.

Abdomen above black, a slight reddish or grayish spot on side of second segment; hind margins of segments with a thin line of yellowish-white hair which may form a median row of small triangles; venter black, with trace of a yellowish fringe on each sternite.

*Male*.—Facets of eye nearly uniform in size, with no distinct line of differentiation. Coloration essentially as in female but hair of head entirely black.

*Type*.—A female in the Canadian National Collection. Paratypes of both sexes in the Canadian National Collection; a paratype in the Museum of Comparative Zoology.

*Type locality*.—Banff, Alberta.

*Distribution*.—Mountains from Alaska to Colorado. June 12 (Mount McLaine, British Columbia) to September 15 (Jasper Park, Alberta). In the United States National Museum, 31 females.

#### TABANUS LATICALLUS Philip

(Fig. 74, A)

*Tabanus laticallus* Philip, Canad. Ent. 68: 150-151, 1936.

Small; blackish, the abdomen with three rows of gray spots; wing hyaline; prescutal lobe black; ocellar tubercle distinct; frons broad; basal callus transverse; subcallus pollinose; palpus stout, with black hair.

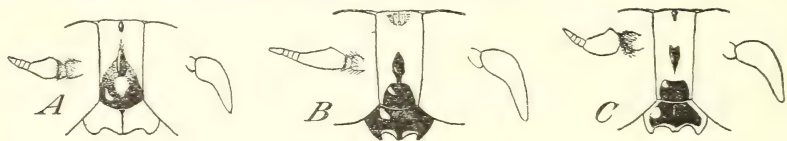


FIGURE 74.—Antenna, front view of head, and palpus of (A) *Tabanus laticallus*, (B) *T. rhombicus*, and (C) *T. fetus*.

*Female*.—Length 12 mm. Eye indistinctly pilose (probably rubbed), purple, with four green bands. Whole head gray, the clypeus and genae with white hair. Frons twice as high as wide, with parallel sides; basal callus dark brown, paler medianly, about two and one-half times as wide as median height but higher at sides, merging laterally with median callus and leaving a pollinose median patch between the two calli; ocellar tubercle distinct, orange brown; subcallus somewhat swollen, with deep median sulcus. Antenna dark, the first two segments tinged with brownish and the third with some orange at extreme base; first segment short and stout; third short, with indistinct dorsal angle and no excision. Palpus creamy white, the second segment somewhat swollen basally, rather acute apically, with mixed white and black hairs. Proboscis short, the labellae large.

Mesonotum blackish, with five gray lines in the usual pattern; prescutal lobe nearly black. Pleura, sternum, and coxae dark gray, with white hair and some black hair on upper pleura. Wing hyaline, the venation normal. Legs dark brown, the extreme base of fore tibia and all but apices of middle and hind tibiae yellowish brown; hind tibial fringe black.

Abdomen black above, with three rows of prominent gray spots, the median triangles indistinct in type specimen; sublateral spots with inner margins nearly

parallel, outer margins oblique, reaching to lateral margin and slightly widened there; venter dark gray, the incisures paler.

*Male*.—Unknown.

*Type*.—In the collection of the University of Minnesota.

*Type locality*.—Greenbush, Minn.

*Distribution*.—Known from single type specimen.

The type is apparently considerably rubbed, and it is probable that good specimens would show the light-gray pollen on frons, thorax, and abdomen to be more extensive.

#### TABANUS RHOMBICUS Osten Sacken

(Fig. 74, B)

*Tabanus rhombicus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4) : 472, 1876; U. S. Geol. and Geogr. Survey Terr. Bull. 3 : 218, 1877; Hine, Ohio Nat. 5 : 242-243, 1904; Cameron, Bull. Ent. Research 17 : 36-37, 1926; Rowe and Knowlton, Canad. Ent. 67 : 243-244, 1935; Philip, Canad. Ent. 68 : 152-153, 1936.

*Tabanus centron* Marten, Canad. Ent. 14 : 211-212, 1882; Hine, Ohio Nat. 5 : 235, 1904; Philip, Canad. Ent. 67 : 94-95, 1935; Rowe and Knowlton, Canad. Ent. 67 : 241, 1935.

*Tabanus osburni* Hine, Ohio Nat. 5 : 241, 1904; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80 : 114, 1931; Rowe and Knowlton, Canad. Ent. 67 : 243, 1925; Philip, Canad. Ent. 68 : 153, 1936.

*Hybomitra solox* Enderlein, Mitt. Zool. Mus. Berlin 10 : 347, 1922; 11 : 364, 1925. (New synonymy.)

Rather small, stout; black, with three rows of gray triangles on abdomen sometimes evanescent, the sublateral spots little, if any, reddened; prescutal lobe black; subcallus black, denuded; third antennal segment rather long, slender.

*Female*.—Length 12-16 mm. Eye pilose, purple, with four narrow, blue-green, diagonal stripes. Frons gray, about three times as high as basal width, distinctly widened above; basal callus shiny chestnut brown to black, convex, subquadrate, usually touching eyes; median callus small, ovate, black, usually with a slender line to vertex and another to basal callus; a large, partially denuded ocellar tubercle at vertex; subcallus entirely denuded, concolorous with basal callus. First two antennal segments yellow brown to black, the first with long black hair; third usually orange brown at least basally and this color occasionally covering most of basal portion, the remainder black; basal portion long and slender, with low dorsal angle and no excision. Clypeus and genae light gray, with whitish hair. Palpus yellowish brown, with concolorous hair and second segment with short black hair; second segment moderately stout basally.

Thorax entirely black or dark gray, the dorsum with narrow gray lines in usual pattern, erect black hair, and some recumbent, pale-yellowish to whitish hair; pleura and coxae with mostly yellowish-white hair. Wing hyaline, the costal cell often faintly brownish; venation normal. Legs brownish black, the tibiae slightly lighter basally, with short yellowish hair; hind tibial fringe short, black.

Abdomen above black, with three rows of usually distinct, dull grayish spots; median triangles not reaching anterior margin of tergites; sublateral triangles with outer margins oblique and reaching lateral margins; venter rather uniformly dull grayish.

*Male*.—Eye with dense, long pile, the facets nearly uniform in size; antenna black; second palpal segment stout, with blunt apex, yellowish brown, the under surface darkened. Body coloration essentially as in female, the entire thorax black, subshiny.

*Type*.—A specimen labelled type by Osten Sacken, one of four cotype females in the Museum of Comparative Zoology, No. 4030, herein designated as the lectotype. One of the cotypes is *Tabanus hirtulus* (Bigot).

*Type locality*.—Colorado.

*Distribution*.—British Columbia to Arizona, Colorado, and Minnesota. June 15 (Kaslo, British Columbia) to September 3 (Mount Rainier, Wash.). In United States National Museum, 189 females.

**TABANUS RHOMBICUS variety RUPESTRIS McDunnough**

*Tabanus rupestris* McDunnough, Canad. Ent. 53: 143-144, 1921; Philip, Canad. Ent. 68: 153, 1936.

This variety differs from typical specimens of *rhombicus* in the presence of a considerable amount of orange on the side of the abdomen and the venter. Structurally the two forms appear identical.

*Type*.—A female in the Canadian National Collection. Paratypes, two females in the Canadian National Collection.

*Type locality*.—Gallatin County, Mont.

*Distribution*.—Idaho and Montana to Colorado. July 5 (Yellowstone Park, Wyo.) to August 9 (Ravalli County, Mont.). In the United States National Museum, 14 females, 3 males.

*Tabanus osburni* Hine is based upon specimens that are somewhat blacker and more shiny in appearance than typical *rhombicus*, with the abdominal triangles less distinct and the costal cell slightly brownish. It seems to occur in the more northern part of the range. This slight color difference and the intergradation between the two forms makes its recognition as a variety of doubtful value. The type of *Hybomitra solox* Enderlein was examined by the writer and proved to be *T. rhombicus*, typical form. Philip has shown *T. centron* Marten to be a synonym of *rhombicus*.

*Tabanus rhombicus* is of considerable economic importance in the northern Rockies, where it occurs in abundance.

**TABANUS FRETUS, new species**

(Fig. 74, C)

Small; dark brownish black, with three rows of pale spots on abdomen; pleura with dense white hair; wing hyaline; eye pilose; subcallus denuded.

*Female*.—Length 12 mm. Eye densely pilose, purple, with four green bands. Frons gray tinged with yellow brown, with black hair, three times as high as basal width, somewhat widened above; basal callus shiny dark chestnut brown, convex, nearly round, not quite touching eyes; median callus black, rather small; ocellar tubercle orange brown, protuberant; subcallus denuded except along lateral margins and around antennae, concolorous with basal callus. First two antennal segments yellow brown, with black hair; third with basal portion orange, annulate portion black; dorsal angle distinct, the excision shallow. Clypeus and genae white, with white hair. Palpus creamy white, with white and some scattered black hair; second segment stout basally. Proboscis rather short, the labellae large.

Mesonotum dark brown, with five indistinct paler stripes in usual pattern; prescutal lobe yellow brown. Pleura, sternum, and coxae light gray, with white hair, the upper mesopleurite tinged with reddish, with a little black hair. Wing hyaline, the venation normal. Legs yellowish brown, the middle and hind femora grayish on basal half and fore tarsus dark brown; hind tibial fringe black.

Abdomen above blackish tinged with orange laterally; a median row of small pale-yellowish spots on tergites 1-5 and oblique sublateral spots on tergites 2-5, that on tergite 2 largest, reaching to anterior margin; venter uniformly light yellow orange.

*Male*.—Eye densely pilose, the large and small facets not sharply differentiated; frontal triangle light gray; clypeus and genae entirely white, with white hair; palpus light yellow brown, the second segment cylindrical, about twice as long as thick, with blunt apex. Dorsum of thorax blacker than in female, the lines not evident; pleura with pile entirely white; legs slightly



darker than in female. Sublateral spots on second tergite not attaining anterior margin; some black basally and medianly on venter.

*Type*.—A female, United States National Museum No. 51974. Allotype, United States National Museum, No. 51974; a paratype male in the collection of the Boston Society of Natural History and a paratype male in the collection of Ohio State University.

*Type locality*.—Lyme, Conn.

*Distribution*.—Connecticut to New Jersey, on coast. May 26 (New Haven, Conn.) to June 30 (Lyme, Conn.). Type and allotype collected at Lyme, May 26 and June 30, respectively, by W. S. Fisher; the paratype, at Lakehurst, N. J., May 30, 1912, by Wm. T. Davis.

#### TABANUS LIORHINUS Philip

(Fig. 75, A)

*Tabanus liorhinus* Philip, Canad. Ent. 68: 151–152, 1936.

Rather small; grayish, with three rows of pale spots on abdomen; legs nearly uniformly reddish brown; subcallus denuded; palpus very short, stout; antenna rather slender, the base of third segment orange; vein R<sub>4</sub> with stump vein.



FIGURE 75.—Antenna, front view of head, and palpus of (A) *Tabanus liorhinus* and (B) *T. melanorhinus*.

*Female*.—Length 13–15 mm. Eye with rather sparse, short pile, dark purple, with four bluish-green diagonal bands. Frons gray, faintly tinged with yellow, about three times as high as width at base, widened above; basal callus shiny dark brown, subquadrate, touching eyes; median callus a short, rather stout projection above; ocellar tubercle small, distinct, orange; subcallus denuded except around lateral and ventral margins, concolorous with basal callus. Antenna with first and second segments and basal half of basal portion of third orange, the remainder black; first two segments with short black hair; third with a short, obtuse, dorsal angle, a very shallow dorsal excision, and the annulate portion nearly or quite as long as basal portion. Clypeus and genae gray, with some dark hair above, but mostly pale haired. Palpus creamy white, the second segment with pale hair and on apical half with scattered black hair, very short and swollen, with apex acute.

Mesonotum dark gray, with light-gray stripes in usual pattern and yellowish brown from humeral lobe over prescutal lobe to scutellum. Pleura and coxae yellowish brown, with a mixture of black and white hair; sternum dark gray. Wing hyaline, with a stump vein and a very faint brownish spot at furcation. Legs reddish brown, the apices of tibiae and the tarsi darker; hind tibial fringe black.

Abdomen above dark brownish black, faintly tinged with orange laterally, with a median row of gray triangles and sublateral oblique spots on tergites 2–5; venter nearly uniformly dull reddish brown.

*Male*.—Eye densely pilose, particularly above, the areas of large and small facets rather distinctly differentiated; frontal triangle pollinose, the upper portion brown, lower portion gray; palpus stout, yellowish brown, with black and paler hair. Sides of tergites 2–5 rather strongly orange brown.

*Type*.—A female in the Canadian National Collection. The allotype male in the C. B. Philip collection; four paratypes in the United States National Museum, No. 51975; other paratypes in the Museum of Comparative Zoology, the Canadian National Collection, and the collection of the University of Minnesota.

*Type locality*.—Red Lake Falls, Minn.

*Distribution*.—British Columbia to Labrador and Nova Scotia. July 18 to August 27 (Baddeck, Cape Breton Island, Nova Scotia).

**TABANUS MELANORHINUS Bigot**

(Fig. 75, B)

*Tabanus melanorhinus* Bigot, Mem. Soc. Zool. France 5: 642-643, 1892; Philip, Canad. Ent. 68: 155, 1936.

Rather small; blackish, with three rows of gray spots on abdomen; prescutal lobe yellow brown; femora dark; subcallus denuded; eye pilose; palpus stout basally.

*Female*.—Length 11-15 mm. Eye with dense, short pile, purple, with four green bands. Frons yellowish gray, three times as high as width at base, distinctly widened above; basal callus shiny dark brown to black, subquadrate or slightly wider than high, touching eyes, and usually somewhat rounded above; median callus black, small, not well defined and usually not joined to basal callus; ocellar tubercle small but distinct, usually orange brown; subcallus denuded, concolorous with basal callus. First two antennal segments gray, with black hair; third black tinged with orange brown basally; dorsal angle distinct, obtuse; dorsal excision moderate; annulate portion shorter than basal portion. Clypeus and lower genae white, with white hair, the upper genae tinged with yellow, with black hair. Palpus creamy white, the second segment stout basally, with mixed black and white hair.

Mesonotum black, with gray lines in usual pattern, erect black and recumbent yellowish-white hair; prescutal lobe yellow brown. Pleura, sternum, and coxae gray, with white hair, the mesopleurite somewhat reddish, with black hair. Wing hyaline, the costal cell slightly darkened; venation normal or rarely a short stump from vein R<sub>4</sub>. Femora gray; rest of legs yellowish brown, the tarsi, particularly fore tarsus, and apex of fore tibia darkened; hind tibial fringe black.

Abdomen above grayish black, with a median row of narrow gray triangles and sublateral, oblique, yellowish-gray spots, the ground color around them frequently yellowish brown; venter nearly uniformly yellowish brown.

*Male*.—Eye densely pilose, the upper facets distinctly larger but the line of differentiation not marked; frontal triangle protuberant, denuded; second palpal segment about twice as long as wide. Body coloration essentially as in female.

Described from a specimen in the United States National Museum reared at Topaz, Calif., June 20, 1918.

*Type*.—A female, in the British Museum.

*Type locality*.—Washington.

*Distribution*.—British Columbia to California and western Montana. June 7 (Topaz, Calif.) to August 9 (Laurel, Mont.). In the United States National Museum, 26 females, 1 male.

A specimen compared with the type by Austen and lent to the writer by Philip has been studied. This species is very close to *opacus* Coquillett, differing in the denuded subcallus. Both *melanorhinus* and *opacus* were reared from larvae collected at Topaz, Calif. It is barely possible that the two are the same species, but the writer has not seen intergradation between the two such as is found in the two forms of *T. hirtulus*.

**TABANUS MICROCEPHALUS Osten Sacken**

(Fig. 76, A)

*Tabanus microcephalus* Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 470-471, 1876; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 111-112, 1931.

Rather small, but stout; blackish, with three rows of gray triangles on abdomen; femora and tibiae nearly uniformly brown; subcallus pollinose; third antennal segment slender.

*Female*.—Length 13–16 mm. Eye with short, fine pile. Frons gray tinged with yellow brown, two and three-fourths to three and three-fourths times as high as width at base, widened to about middle and then slightly narrowed; basal callus chestnut brown, nearly square; median callus a dark-brown to black, usually depressed line attached to basal callus and of about equal length; a bare, vertical, oblong spot at vertex bearing an indistinct ocellar tubercle; subcallus slightly swollen, pollinose, concolorous with frons. Antenna orange brown, the annulate portion black and basal portion outwardly darkened; first two segments with black hair, the first rather short but not greatly enlarged above; third slender, the dorsal angle either very indistinct or distinct but short; annulate portion stout, somewhat shorter than basal portion. Clypeus and genae gray, with white hair. Second palpal segment yellowish brown, with black hair, stout at base, but tapering to a slender apex. Proboscis short.

Mesonotum, including prescutal lobe, black, with gray lines in usual pattern. Pleura, sternum, and coxae gray, with white hair. Wing hyaline, the costal cell and vein margins often faintly washed with yellowish; veins dark brown,



FIGURE 76.—Antenna, front view of head, and palpus of (A) *Tabanus microcephalus* and (B) *T. brennani*.

the venation normal. Legs almost uniformly dull orange brown, the fore tibia with some white hair on basal two-thirds and black hair apically; other tibiae with mixed black and white hair, but no pronounced tibial fringe.

Abdomen above black tinged with brown laterally and with three rows of gray spots; these spots rarely touch anterior margin of tergites, are largest on second tergite where the sublateral spots broadly join hind margin, and are progressively smaller behind this; venter reddish brown to nearly black.

*Male*.—Eye with dense, short pile, the facets of nearly uniform size. Coloration essentially as in female.

*Type*.—A female from the White Mountains collected by S. H. Scudder, one of four female and one male cotypes in the Museum of Comparative Zoology, No. 4028, herein designated as the lectotype.

*Type locality*.—White Mountains, N. H.

*Distribution*.—Minnesota and Maine to Ohio and North Carolina. July 6 (Big Indian Valley, Catskill Mountains, N. Y.) to September 15 (Rostrevor, Ontario). In the United States National Museum, 21 females, 2 males.

#### TABANUS BRENNANI, new species

(Fig. 76, B)

Rather small; grayish, with three rows of spots on abdomen, the sublateral spots surrounded by yellowish brown; legs dull reddish brown; antenna predominantly orange; subcallus pollinose.

*Female*.—Length 14 mm. Eye with dense, long pile. Frons gray, about three times as high as basal width, slightly widened above; basal callus dark brown, about one and one-half times as wide as high, touching eyes; median callus black, lanceolate, narrowly joined to basal callus; ocellar tubercle small, yellowish brown; subcallus concolorous with frons. First two antennal segments yellow brown, with black hair; third orange, the upper margin beyond dorsal angle blackened and annulate portion slightly darker; basal portion rather stout, the dorsal angle distinct but obtuse, the excision slight. Clypeus and genae gray, with white hair, the upper genae tinged with yellowish, and with a few black hairs. Palpus yellowish brown, with mixed black and white hair; first segment somewhat larger than usual; second stout basally, tapering to rather



narrow apex, the anterior margin with a distinct angle. Proboscis scarcely longer than palpus.

Mesoscutum discally and scutellum blackish, the former with narrow gray lines in usual pattern; margin of mesoscutum from humerus to scutellum yellowish brown. Pleura, sternum, and coxae gray tinged with reddish, with white hair, and some black hair above. Wing hyaline, the costal cell dark brown and all veins faintly margined with brown; venation normal. Legs dull orange brown, the bases of middle and hind tibiae and the tarsi slightly darker; hind tibial fringe black.

Abdomen above blackish, the sides of tergites 1-4 yellow orange, leaving a broad, black, median stripe; a median row of narrow yellowish-gray spots and sublateral light-yellowish spots; venter dull reddish, darkened at base and apex.

*Male*.—Unknown.

*Type*.—In the American Museum of Natural History.

*Type locality*.—Franconia, N. H.

The specimen is labelled, "Collection of Mrs. A. T. Slosson." The writer takes great pleasure in naming this species in honor of James M. Brennan, one of our leading students of Tabanidae. This species lies on the border line between the orange-sided species and those with three rows of abdominal spots, but it is apparently quite distinct from any species in either of these groups.

#### TABANUS ITASCA Philip

(Fig. 77, A)

*Tabanus itasca* Philip, Canad. Ent. 68: 149, 1936.

Rather small; blackish brown, with three rows of gray spots on abdomen; basal callus and prescutal lobe yellowish brown; wing hyaline; subcallus pollinose; eye pilose; frons broad; palpus moderately stout basally.



FIGURE 77.—Antenna, front view of head, and palpus of (A) *Tabanus itasca* and (B) *T. atrobasis*.

*Female*.—Length 13 mm. Eye pilose. Frons gray tinged with brownish, slightly more than twice as high as width at base, slightly widened above; basal callus shiny yellow brown, protuberant, slightly wider than high and nearly touching eyes; median callus dark brown, separated from basal callus, about half as wide as high, the height subequal to width of basal callus; ocellar tubercle orange brown, small but distinct; subcallus concolorous with frons. Antenna yellow brown, somewhat darkened apically; first two segments with black hair; third slender, the dorsal angle obtuse and excision shallow. Clypeus and genae light gray, with mostly white hair. Palpus pale yellow brown, with white hair and some black hair on second segment; second segment slightly swollen basally and tapering to an acute apex. Proboscis only slightly exceeding apex of palpus.

Mesonotum dark brown, with five gray lines; prescutal lobe yellow brown; upper pleura and coxae gray tinged with reddish; lower pleura and sternum dark gray, the whole with white hair except some black hair on mesopleurite. Wing entirely hyaline, the venation normal. Legs light brownish, the apex of fore tibia and the tarsi darkened; hair of tibiae mostly whitish including hind tibial fringe.

Abdomen above dark brown, with three rows of light-gray spots and hind margins with narrow bands; median triangles small, largest on second tergite; sublateral spots large, oblique, reaching length of tergites, except on second, where they do not reach anterior margin; venter uniformly light gray tinged with reddish, the hair white except for some black near apex medianly.

*Male*.—Unknown.

*Type*.—A female in the collection of the University of Minnesota. Paratype also in the University of Minnesota collection.

*Type locality*.—Itasca Park, Minn.

*Distribution*.—Known only from the type locality.

**TABANUS ATROBASIS McDunnough**

(Fig. 77, B)

*Tabanus atrobasis* McDunnough, Canad. Ent. 53: 144, 1921.

Medium sized, stocky; dark brown or blackish, with orange or reddish on sides of abdomen not reaching across first tergite; palpus stout, yellowish brown; subcallus pollinose; prescutal lobe black.

*Female*.—Length 15–17 mm. Eye densely pilose, with four diagonal green stripes on a deep-purple ground. Frons three to three and one-half times as high as width at base, somewhat widened above, yellowish gray; basal callus shiny black, subquadrate, not quite touching eyes; median callus small, usually connected by a slender line to basal callus and ocellar tubercle; the latter with gray pollen or denuded, nearly as wide as vertex but not sharply defined; subcallus rather flat, yellowish gray. Antenna mostly black, the first two segments reddish brown, with black hair, the third reddish at extreme base; basal portion of third rather elongate, dorsal angle short and obtuse and dorsal excision very shallow or absent; annulate portion much shorter than basal portion. Clypeus and genae yellowish gray, with a mixture of white, yellowish, and black hair. Second palpal segment moderately stout, tapering, yellowish brown, with short black hair.

Mesonotum, including prescutal lobe, black, with five faint brownish lines. Pleura, sternum, and coxae dark gray, the hair black except around wing base and on coxae. Wing nearly hyaline, the costal cell tinged with orange brown, veins brown and a small spot at furcation; venation normal. Femora black; tibiae dull orange to black, the fore tibia gradually darkened apically; tarsi dark orange brown to black.

First abdominal tergite black except for a narrow posterior margin of orange; sides of tergites 2–4 orange brown, with faint, yellowish, diagonal triangles, leaving a rather broad, median, black stripe narrowing to tergite 4 and bearing a median row of rather distinct, small, yellowish triangles; tergites 4–6 dark brown to black; venter orange brown, darker apically.

*Male*.—Eye densely pilose, the facets nearly uniform in size; second palpal segment stout, dark orange brown, with black hair. Coloration essentially as in female, the frontal triangle gray and genae dark gray, with mostly black hair.

Described from a specimen collected at Moscow, Idaho, July 25, 1920, by R. C. Shannon.

*Type*.—A female in the Canadian National Collection. \*Paratypes also in the Canadian National Collection and three in the Museum of Comparative Zoology.

*Type locality*.—Mount Lehman, British Columbia.

*Distribution*.—British Columbia to New Mexico. May 30 (Mt. Lehman, British Columbia) to July 25 (Moscow, Idaho). In the United States National Museum, 10 females, 1 male.

**TABANUS HIRTULUS (Bigot)**

(Fig. 78, A)

?*Therioplectes tetricus* Marten, Canad. Ent. 15: 111, 1883.

*Therioplectes hirtulus* Bigot, Mem. Soc. Zool. France 5: 641–642, 1892.

*Tabanus frenchii* Hine (not Marten), Ohio Nat. 5: 237, 1904.

*Tabanus opacus* Hine (not Coquillett), Ohio Nat. 5: 240–241, 1904.

*Tabanus hirtulus* Hadwen, Brit. Columbia Ent. Soc. Proc. 4 (n. s.): 48, 1914;

Cameron, Bull. Ent. Research 17: 27–28, 1926; Rowe and Knowlton, Canad.

Ent. 67: 242, 1935; Philip, Canad. Ent. 68: 155, 1936.

?*Tabanus tetricus* Philip, Canad. Ent. 67: 93, 1935.

Medium sized; blackish, with three rows of gray spots on abdomen, the sublateral spots often tinged with brown; prescutal lobe yellowish brown;

subcallus usually pollinose; frons rather wide; a stump vein, often rather long, from base of vein  $R_4$ .

*Female*.—Length 15–17 mm. Eye pilose, greenish blue, with three narrow purple stripes. Frons gray, about three and six-tenths times as high as width at base, somewhat widened above; basal callus black, subquadrate, touching eyes; median callus black, about same length, and usually narrowly joined to basal callus; ocellar tubercle small, yellowish brown; subcallus usually with gray pollen, but at times partially or entirely denuded. First two antennal segments reddish brown to gray, with black hair; third black, sometimes tinged with orange at extreme base; basal portion slender, dorsal angle slight and dorsal excision very shallow; annulate portion somewhat shorter than basal portion. Clypeus and genae gray, with mostly white hair. Second palpal segment stout at base and tapering to a point, creamy white, with concolorous and some black hair.



FIGURE 78.—Antenna, front view of head, and palpus of (A) *Tabanus hirtulus* and (B) *T. opacus*.

Mesonotum dark gray, with lighter gray stripes in usual pattern; prescutal lobe at least tinged with yellowish brown. Pleura, sternum, and coxae dark gray, with a mixture of black and whitish hair. Wing hyaline, the base of vein  $R_4$  usually with a stump which may be quite long. Legs black, the basal half of fore tibia and most of middle and hind tibiae orange brown, with cream-colored hair; hind tibial fringe mostly black.

Abdomen above black, with three rows of gray spots, the median row consisting of small triangles not reaching length of tergites, the sublateral spots rather small, often tinged with brownish; venter gray, tinged basally with reddish brown.

*Male*.—Eye densely pilose, the areas of large and small facets only weakly differentiated; second palpal segment stout, with mostly black hair. Color of body throughout agreeing with female.

*Type*.—A female in the British Museum.

*Type locality*.—Washington.

*Distribution*.—Washington and Alberta to Ontario and south to California, New Mexico, and Illinois. June 2 (Friday Harbor, Wash.) to August 14 (Logan, Utah). In the United States National Museum, 83 females, 2 males.

The *Tabanus opacus* Coquillett of Hine is this species and not the true *opacus*. Hine later studied the type of *hirtulus*, and a specimen which he compared with the type fits the above description. Philip has suggested that *T. tetricus* Marten represents the form of this species in which the subcallus is denuded. This may well be so, but, since the Marten types are lost, it hardly seems desirable to make the change of name that would be necessary if *tetricus* were to be recognized.

This is one of the abundant species of the Northwest.

#### TABANUS OPACUS Coquillett

(Fig. 78, B)

*Tabanus opacus* Coquillett, in Baker, *Invertebrata Pacifica*, v. 1, pp. 21–22, 1904; Philip, *Canad. Ent.* 68: 154–155, 1936.

Rather small; grayish brown, with three rows of pale spots on abdomen, the sublateral spots oblique; prescutal lobe reddish; femora black; ocellar tubercle



present; eye pilose; frons rather broad and distinctly widened above; palpus stout.

*Female*.—Length 12–15 mm. Eye with dense, short pile, purple, with four green bands. Frons gray tinged with yellow, about three times as high as width at base, distinctly widened above; basal callus shiny chestnut brown to black, convex, subquadrate, touching eyes, rounded above; median callus black, rather small, separated from, or narrowly joined to, basal callus; ocellar tubercle reddish brown, often not clearly defined. Subcallus and upper genae concolorous with frons. First two antennal segments yellow brown, with gray pollen and black hair; third black, with more or less orange basally; dorsal angle and excision moderate. Clypeus and lower genae white, with white hair. Palpus creamy white, with white and some scattered black hair; second segment stout basally.

Mesonotum blackish, with five gray lines in usual pattern; prescutal lobe yellow brown. Pleura, sternum, and coxae gray, with mostly white hair. Wing hyaline, the venation normal. Femora dark, with gray pollen; tibiae yellow brown, the apical half of the fore tibia darkened; hind tibial fringe black; tarsi orange to dark brown, the fore tarsus darkest.

Abdomen above blackish, with considerable yellow brown laterally; a median row of narrow, contiguous, yellow-gray triangles and oblique, sublateral, yellowish spots, the latter narrow anteriorly, touching hind margins of tergites 2 and 3, at least, and with inner margins slightly concave; venter predominantly yellowish brown.

*Male*.—Eye with dense, long pile, the large and small facets rather distinctly differentiated; frontal triangle with thin gray pollen; second palpal segment creamy white, less than twice as long as thick, with blunt apex. Coloration essentially as in female.

*Type*.—The female of a pair of cotypes, United States National Museum No. 7319, herein designated as lectotype.

*Type locality*.—Ormsby County, Nev.

*Distribution*.—Alberta to northern California and Colorado. June 5 (Salt Lake County, Utah) to July 25 (Trout Creek, Utah). In the United States National Museum, 19 females, 3 males.

#### TABANUS FRONTALIS Walker

(Fig. 79, A)

*Tabanus frontalis* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, pp. 172–173, 1848.

*Tabanus incisus* Walker, Insecta Saundersiana, Diptera, v. 1, pp. 26–27, 1850. (New synonymy.)

Medium sized; thorax grayish; abdominal pattern usually consisting of a broad, dark, median stripe bearing grayish triangles and yellowish-brown sublateral spots; wing hyaline; prescutal lobe at least tinged with yellow orange; subcallus pollinose.

*Female*.—Length 13–16 mm. Eye sparsely but distinctly pilose. Frons yellowish gray; basal callus shiny brown to black, square or slightly wider than high, usually rounded above and touching eyes, and usually connected to the slender, black, median callus; ocellar tubercle distinct, orange brown; subcallus, clypeus, and genae gray, the former tinged with yellow. First two antennal segments orange, the third black except at extreme base; dorsal angle of third not prominent and excision scarcely evident; annulate portion shorter than basal portion. Palpus pale yellowish, with scattered black hair, the first segment entirely white haired; second moderately stout at base.

Mesonotum black, with gray stripes; prescutal lobe usually orange. Rest of thorax and coxae gray, with black and grayish hair. Wing hyaline, the venation normal, rarely a short stump from vein R<sub>1</sub>. Legs orange brown, femora grayish, and tarsi and apex of fore tibia darkened; hind tibial fringe dark.

Abdomen above grayish black, with a narrow median row of yellowish-gray triangles and a sublateral row of large orange-brown spots, usually contiguous; these spots distinctly grayed and not shiny orange as in many related species; the sublateral spot on first tergite not quite touching the anterior margin; venter orange brown, darker medianly or entirely grayish black.

*Male*.—Unknown.

38521°—38——11

*Type*.—A female in the British Museum.

*Type locality*.—Nova Scotia.

*Distribution*.—Montana and Colorado, and New York to Nova Scotia. June 17 (Peru, N. Y.) to September 19 (Cameron Pass, Colo.). In the United States National Museum, 53 females.

The writer has seen specimens compared by Hine with the types of both *Tabanus frontalis* and *T. incisus*. This species has been determined as *septentrionalis* many times and quite closely resembles it, but the writer believes it can be separated on the characters given in the key. On the other hand, specimens with somewhat more reddish sublaterally than usual are difficult to separate from *sonomensis*. It is to be hoped that further study may more clearly define these difficult western species.



FIGURE 79.—Antenna, front view, and palpus of (A) *Tabanus frontalis* and (B) *T. septentrionalis*.

#### TABANUS SEPTENTRIONALIS Loew

(Fig. 79, B)

*Tabanus septentrionalis* Loew, Verhandl. Zool.-Bot. Gesell. Wien 8: 592-593, 1858; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 467-469, 1876; Coquillett, Wash. Acad. Sci. Proc. 2: 406-407, 1900; Hine, Ohio Nat. 5: 243, 1904; Cameron, Agr. Gaz. Canada 5: 560, 1918; Hine, Canad. Ent. 55: 145, 1923; Cameron, Bull. Ent. Research 17: 37-38, 1926; Philip, Minn. Agr. Expt. Sta. Tech. Bull. 80: 115, 1931.

*Tabanus canadensis* Curran, Canad. Ent. 59: 82-83, 1927. (New synonymy.)

*Tylostypia septentrionalis* Enderlein (not Loew?), Mitt. Zool. Mus. Berlin 11: 363, 1925.

*Stypommia septentrionalis* Enderlein, Sitzber. Gesell. Naturf. Freunde Berlin 1934: 185, 1934.

Rather small; blackish, with three rows of gray triangles on abdomen; femora dark; subcallus pollinose; eye pilose; palpus rather stout; third antennal segment slender; frons moderate in width and not greatly widened above; stump vein from vein R, rarely present.

*Female*.—Length 10-14 mm. Eye pilose, blue green, with three narrow purple bands and upper and lower margins tinged with purplish. Frons about three and one-half times as high as width at base, slightly widened above; frontal callus subquadrate or slightly wider than high, touching eyes, chestnut brown to black; median callus narrowly lanceolate, black, usually somewhat roughened and rarely connected with basal callus; ocellar tubercle orange brown, small but distinct; subcallus gray, the antennal pits yellowish. First two antennal segments yellowish brown to gray, with black hair, the second with a distinct dorsal process; third black, the basal half of basal portion usually orange; dorsal angle obtuse and excision very shallow, the annulate portion shorter than basal portion. Clypeus and genae light gray, with mostly white hair. Palpus creamy white, the second and often the first segment with black hair mixed with pale hair; second segment somewhat swollen basally.

Mesonotum black, with faint gray lines in usual pattern; prescutal lobe usually reddish brown. Pleura, sternum, and coxae dark gray tinged with reddish, with a mixture of pale and dark hair in varying proportions. Wing faintly brownish, the venation normal or rarely a short stump from vein R. Femora dark gray to black; tibiae yellowish to rather dark brown, the apical half of fore tibia blackened; hind tibial fringe black; tarsi orange brown to black, the fore tarsus darkest.

Abdomen blackish above, with three rows of gray spots and narrow bands, sometimes tinged with yellowish brown but the sublateral spots not very large and confluent; venter mostly dark, with grayish incisures.

*Male*.—Unknown to the writer and not sufficiently well described to permit distinction between this and related species.

*Type*.—A female, probably in the Berlin Museum.

*Type locality*.—Labrador.

*Distribution*.—Alaska to Labrador and south to Colorado, Minnesota, and Quebec. June 10 (Anchorage, Alaska) to September 1 (Leadville National Forest, Colo.). In the United States National Museum, 274 females.

This species shows some variation, and attempts have been made to give the variations specific value. Specimens from Labrador, the type locality, are somewhat darker, and there is usually black hair on the first palpal segment, as mentioned in the original description, as well as more black hair on the thorax and abdomen than in specimens from the more western portion of its range. The writer has examined the type of *Tabanus canadensis* Curran and does not feel that the name should be used even for varietal status. *T. frontalis* Walker is also extremely close and may not deserve specific status, but for the present the writer prefers to consider it distinct. Whether Enderlein correctly determined *septentrionalis* when he placed it in the genus *Tylostypia* is open to considerable doubt, since the stump from vein  $R_4$ , characteristic of *Tylostypia*, is rarely present.

This is one of the economically important species of the North and West.

#### UNRECOGNIZED SPECIES

***Tabanus calens*** Linnaeus, Systema Naturae, ed. 12, v. 1, pt. 2, p. 1000, 1767; Degeer, Memoires pour servir a l'histoire des insectes, v. 6, p. 226, 1776; Fabricius, Entomologia Systematica, v. 4, p. 364, 1794; Wiedemann, Ausser-europäische zweiflügelige Insekten, v. 1, pp. 134–135, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4): 472, 1876.

*Type*.—Sex and collection, if still in existence, unknown. Originally in the Degeer collection.

*Type locality*.—America.

Considerable confusion exists as to the identity of this species. Degeer places it as a synonym of his *Tabanus giganteus*, although the original description, brief as it is, makes this very doubtful. It is quite probably one of the *lineola* group and may be either Nearctic or Neotropical. There is little likelihood that the type could be recognized as the type, if found, and the original description is far too brief to make recognition possible.

***Tabanus comes*** Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 4, p. 1152, 1849; Philip, Canad. Ent. 68: 156, 1936.

*Tabanus incitus* Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 172, 1848. (Preoccupied by *Tabanus incitus* Walker, p. 161.)

*Cotypes*.—Two females, in the British Museum.

*Cotype localities*.—St. Martin's Falls, Albany River, Hudson's Bay; Nova Scotia.

This is perhaps *Tabanus astutus* Osten Sacken, but an examination of the types, from which the heads are missing, would be neces-



sary before this could be determined, and it might prove difficult even then.

**Tabanus crassicornis** Wiedemann, *Diptera Exotica*, pt. 1, pp. 71-72, 1821.

*Type*.—Female, collection unknown.

*Type locality*.—America?

This name is included in the possibility that the type was from North America. The description, however, does not fit any Nearctic species known to me.

**Tabanus derivatus** Walker, *List of the Specimens of Dipterous Insects in the Collection of the British Museum*, pt. 1, p. 151, 1848; Osten Sacken, *Smithsn. Misc. Collect. No. 270*, p. 62, 1878.

*Type*.—A male in the British Museum.

*Type locality*.—North America.

Osten Sacken examined the type and did not recognize it. Hine examined it and found it to be very close to *Tabanus oculus* Walker and to agree absolutely with another specimen in the British Museum collected in Brazil. Since no species of the *oculus* group occur in the Nearctic region, it is not improbable that *derivatus* is Neotropical.

**Tabanus difficilis** Wiedemann, *Aussereuropäische zweiflügelige Insekten*, v. 1, pp. 165-166, 1828; Szilady, *Biologica Hungarica*, v. 1, fasc. 7, p. 30, 1926.

*Type*.—Female, originally in the Vienna Museum.

*Type locality*.—"Vaterland?"

Szilady found a specimen in the Vienna Museum bearing the label "Amer. Bor.", which he claimed to be the type of this species, and redescribed it. It is evident from this description that it is one of the *affinis* group with a denuded subcallus, but just which one cannot be determined. In an effort to learn more about the specimen the writer wrote to the Vienna Museum and learned from Dr. Zerny that the specimen could not be found in their collection.

**Tabanus dorsonotatus** Macquart, *Diptères exotiques nouveaux ou peu connus*, sup. 2, p. 38, 1847; Osten Sacken, *Mem. Boston Soc. Nat. Hist.* 2 (pt. 4, No. 4): 473, 1876; *Smithsn. Misc. Collect. No. 270*, p. 61, 1878.

*Type*.—A male, originally in the Bigot collection and perhaps now in the British Museum.

*Type locality*.—Carolina.

Osten Sacken suggested that this might be the male of *Tabanus rufus* Palisot, which he did not know. Later he examined a *T. dorso-maculatus* in the Bigot collection from Carolina, with a label in Macquart's handwriting, which he took to be the type of *dorsonotatus*. This specimen was in such poor condition that recognition was impossible. That this is *T. fumipennis* Wiedemann (*rufus* Palisot) is not likely, judging from the original description.

**Tabanus duplex** Walker, *List of the Specimens of Dipterous Insects in the Collection of the British Museum*, pt. 5, sup. 1, p. 173, 1854; Cameron (not Walker?), *Bull. Ent. Research* 17: 26-27, 1926.

**Tabanus imitans** Walker, *List of the Specimens of Dipterous Insects in the Collection of the British Museum*, pt. 1, pp. 173-174, 1848. (Preoccupied by *Tabanus imitans* Walker, *ibid.*, p. 146.)

*Cotypes*.—A male and a female in the British Museum.

*Cotype locality*.—St. Martin's Falls, Albany River, Hudson's Bay.

This species, as described, very closely resembles *Atylotus peme-ticus* (Johnson), but the male identified by Hine and described by

Cameron is nearer *ohioensis* Hine. In the Hine collection are a male and a female compared with the types by Hine. The female appears to be *Atylotus ohioensis* (Hine) and the male *A. pemeticus* (Johns.). Notes on the type, made for the writer by John Smart, show it to be near *pemeticus* or *thoracicus*. Until the types can be studied further the name had better be left in abeyance.

***Tabanus ferrugineus*** Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 221, pl. 3, fig. 2, 1805.

*Type*.—Female, collection unknown.

*Type locality*.—United States.

This might possibly be *Tabanus turbidus* Wiedemann, but the description and figure are not sufficient to justify making this synonymy.

***Theriopectes frenchii*** Marten, Canad. Ent. 15: 111, 1883.

*Tabanus frenchii* Philip, Canad. Ent. 67: 93-94, 1935.

*Type*.—Female, no longer in existence.

*Type locality*.—Montana.

For a discussion of this species see Philip's paper.

***Tabanus guttatus*** Wiedemann, Diptera Exotica, p. 73, 1821; Wiedemann, Aussereuropaische zweiflügelige Insekten, v. 1, p. 133, 1828.

*Type*.—Female, originally in Germar's Museum in Halle.

*Type locality*.—America.

Not recognizable from the description.

***Tabanus intermedius*** Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 173, 1848.

*Cotypes*.—A male and a female in the British Museum.

*Cotype locality*.—St. Martin's Falls, Albany River, Hudson's Bay.

It is evident that this species is an *Atylotus*, judging from a female specimen compared with the type by Hine and from information and a drawing supplied the writer by John Smart. The Hine specimen is apparently *A. insuetus* (Osten Sacken), whereas the information from Dr. Smart hardly agrees with any *insuetus* specimens the writer has seen. Because there is considerable doubt about what Walker had, and because it falls in a difficult and variable group, the writer would prefer to leave it unrecognized for the present.

***Tylostypia labradorensis*** Enderlein, Mitt. Zool. Mus. Berlin 11: 363, 1925.

*Type*.—A female in the Berlin Museum.

*Type locality*.—Labrador.

Not recognizable from the description. Enderlein compares this with *Tylostypia septentrionalis* (Loew), which he presumably incorrectly determined, as *septentrionalis* lacks a stump from vein  $R_4$ , a generic character for *Tylostypia* Enderlein. *T. labradorensis* may be *Tabanus hirtulus* (Bigot) or *T. liorhinus* Philip.

***Tylostypia laticornis*** Enderlein, Mitt. Zool. Mus. Berlin 11: 363, 1925.

*Type*.—A female in the Berlin Museum.

*Type locality*.—Southern Colorado.

Not recognizable from the description. Enderlein compares this with *Tylostypia lasiophthalma* (Macquart), which he presumably incorrectly determined, as *lasiophthalmus* lacks a stump from vein  $R_4$ , a generic character for *Tylostypia* Enderlein.

**Tabanus leucomelas** Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 1, p. 175, 1848; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4) : 474, 1876; Philip, Canad. Ent. 68: 156, 1936.

*Type*.—A female in the British Museum.

*Type locality*.—Georgia.

Not recognizable from the original description.

**Tabanus lineola** Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 101, pl. 2, fig. 6, 1805. (Preoccupied by *Tabanus lineola* Fabricius, 1794.)

*Type*.—Female, collection unknown.

*Type locality*.—Unknown.

There is no indication in the original reference that Palisot de Beauvois was redescribing *T. lineola* Fabricius. It is probably a species near *longus* Osten Sacken, but the description and figure are not sufficient to make determination possible.

**Tabanus marginalis** Fabricius, Systema Antliatorum, pp. 99–100, 1805; Wiedemann (? not Fabricius), Aussereuropäische zweiflügelige Insekten, v. 1, pp. 166–167, 1828; Osten Sacken, Mem. Boston Soc. Nat. Hist. 2 (pt. 4, No. 4) : 472, 1876.

*Type*.—Female, probably no longer in existence.

*Type locality*.—North America.

The original description is too meager to permit determination, and there is some question as to whether Wiedemann's description applies to the same species. Osten Sacken suggested that *marginalis* was close to his *T. vivax*, but Wiedemann's description more nearly applies to *fairchildi* Stone or perhaps *nivosus* Osten Sacken.

**Tabanus nebulosus** Palisot de Beauvois, Insectes recueillis en Afrique et en Amerique, p. 222, pl. 3, figs. 4–5, 1813–20. (Preoccupied by *Tabanus nebulosus* Degeer, 1776.)

*Cotypes*.—Two females, collection unknown.

*Cotype locality*.—United States.

Palisot de Beauvois figured two females, with little doubt representing two species, neither of which can be surely recognized.

**Tabanus novae-scotiae** Macquart, Diptères exotiques nouveaux ou peu connus, sup. 2, p. 40, 1847; Osten Sacken, Smithsn. Misc. Collect. No. 270, p. 61, 1878.

*Type*.—Female, originally in the Bigot collection, perhaps now in the British Museum.

*Type locality*.—Nova Scotia.

Not recognizable from the original description. Osten Sacken examined the type and wrote that it was not unlike a small *Tabanus actaeon* Osten Sacken, but that the abdominal triangles have a golden-yellow pubescence.

**Tabanus pubescens** Macquart, Diptères exotiques nouveaux ou peu connus, sup. 2, p. 20, 1847.

*Chelommia* ? *pubescens* Kröber, Rev. Ent. 4: 271, 1934.

*Type*.—Female, originally in the Bigot collection, perhaps now in the British Museum.

*Type locality*.—America.

Not recognizable from the original description. Kröber suggests that it is South American, perhaps belonging in the genus *Chelommia* Enderlein.



**Tabanus quinquevittatus** Wiedemann, *Diptera Exotica*, pt. 1, p. 84, 1821; Wiedemann (? not Wiedemann), *Aussereuropäische zweiflügelige Insekten*, v. 1, p. 173, 1828; Bellardi (? not Wiedemann), *Saggio di ditterologia messicana*, pt. 1, p. 65, 1859; Osten Sacken, *Smithsn. Misc. Collect.* No. 270, pp. 228-229, 1878; Hine (? not Wiedemann), *Ohio Nat.* 7: 26, 1906.

*Types*.—A male and a female in the Winthem collection, Vienna.

*Type locality*.—Savannah.

Osten Sacken examined the types and found them to be very poor specimens but "exceedingly like *costalis*." It is doubtful that the Mexican specimens, one described by Wiedemann in 1828 and the other by Bellardi in 1859, are the same as Wiedemann's original Savannah material. Hine identified a yellowish form of *Tabanus lineola* Fabricius as *quinquevittatus*. The writer does not believe that Hine's form should be given specific rank, and it is very doubtful that this is the same as the original *quinquevittatus* material. Since the species belongs to a very difficult group, the name cannot be given to any species until a further study is made of the types.

**Theriopectes susurrus** Marten, *Canad. Ent.* 15: 111-112, 1883. *Tabanus susurrus* Hine (? not Marten), *Ohio Nat.* 5: 244, 1904; Philip, *Canad. Ent.* 67: 94, 1935.

*Type*.—Female, no longer in existence.

*Type locality*.—Montana.

The original description is inadequate, and it is doubtful that Hine correctly determined material under this name. For a discussion of this species see Philip's paper.

**Tabanus tetropsis** Bigot, *Mem. Soc. Zool. France* 5: 681-682, 1892.

*Type*.—A male in the British Museum.

*Type locality*.—Georgia.

This is evidently a *Stenotabanus* and perhaps the male of *S. floridensis* (Hine). However, until the type can be studied, or the male of *floridensis* discovered, the name had better be left in abeyance.

**Tabanus vicinus** Macquart, *Diptères exotiques nouveaux ou peu connus*, v. 1, pt. 1, p. 143, 1838.

*Type*.—Female, collection unknown.

*Type locality*.—Carolina.

Not recognizable from the original description.

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<i>Division of Insect Identification</i> .....	C. F. W. MUESEBECK, <i>Principal Entomologist, in Charge</i> .



















